RH
t54
223
5

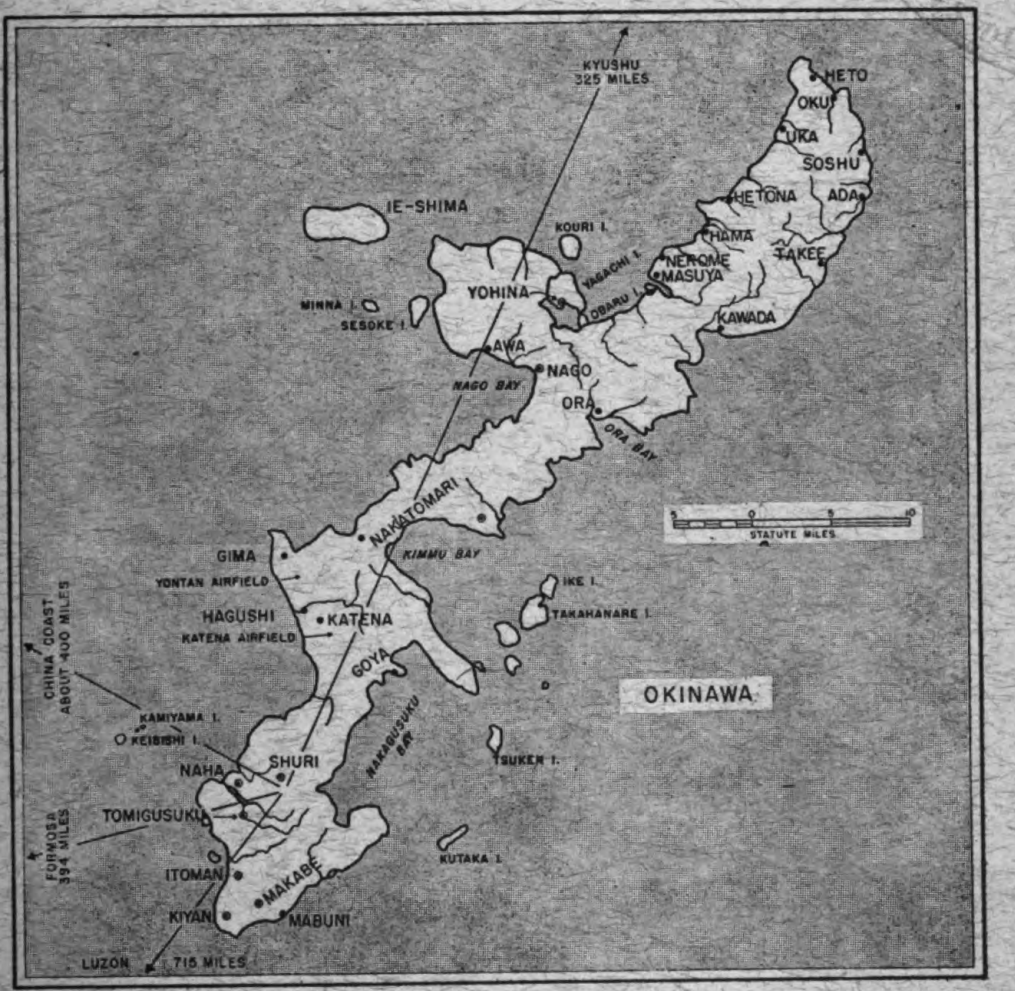
SPECIAL ISSUE

VOL. IV, No. 3 SEPTEMBER 1945

THE BULLETIN

OF THE

U. S. Army Medical Department



ISSUED UNDER THE AUSPICES OF
THE OFFICE OF THE SURGEON GENERAL

PUBLISHED MONTHLY AT THE MEDICAL FIELD SERVICE SCHOOL,
CARLISLE BARRACKS, PENNSYLVANIA

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

By direction of the Secretary of War, the material contained herein is published as administrative information for the proper transaction of the public business and with the approval of the Director of the Budget.

NORMAN T. KIRK,
Major General, U. S. Army,
The Surgeon General.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

VOLUME IV, NUMBER 3 SEPTEMBER 1945

SPECIAL ISSUE

THE BULLETIN

OF THE

U. S. Army Medical Department

ISSUED MONTHLY

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
WASHINGTON 25, D. C.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

THE BULLETIN

OF THE

U. S. Army Medical Department

EDITORIAL STAFF

LIEUTENANT COLONEL JOHNSON F. HAMMOND, M. C., Editor
MR. GEORGE A. SCHEIRER, Managing Editor
MISS HELENA V. KAY, Assistant

EDITORIAL BOARD

MAJOR GENERAL GEORGE F. LULL, U. S. ARMY,
The Deputy Surgeon General, Chairman
MAJOR GENERAL ROBERT H. MILLS, U. S. ARMY,
Consultant in Dentistry
BRIGADIER GENERAL RAYMOND A. KELSER, U. S. ARMY,
Consultant in Veterinary Medicine
BRIGADIER GENERAL HUGH J. MORGAN, U. S. ARMY,
Consultant in Medicine
BRIGADIER GENERAL FRED W. RANKIN, U. S. ARMY,
Consultant in Surgery
BRIGADIER GENERAL JAMES S. SIMMONS, U. S. ARMY,
Consultant in Preventive Medicine
COLONEL WALTER A. CARLSON, M. C.,
Consultant in Aviation Medicine
COLONEL ESMOND R. LONG, M. C.,
Consultant in Tuberculosis
COLONEL AUGUSTUS THORNDIKE, M. C.,
Consultant in Reconditioning
COLONEL WILLIAM C. MENNINGER, M. C.,
Consultant in Neuropsychiatry

Subscriptions may be placed with the Book Department, Medical Field Service School, Carlisle Barracks, Pennsylvania.

Annual subscription: $2.00; foreign subscription: $2.50.
Single copies, domestic, 25 cents; foreign, 30 cents.

All other communications relating to this publication should be addressed to The Surgeon General, U. S. Army, Washington 25, D. C.

Digitized by Google

Original from UNIVERSITY OF CALIFORNIA

AN APPRECIATION

Peace has come to a war-weary world, and while we celebrate we must not forget the toll that has been taken. We must not forget those courageous men who gave their lives that we may now enjoy the fruits of peace. We must not forget the sick and wounded still in the battle zones and in our hospitals here at home. Let me assure you that the Army Medical Department is not going to forget these men.

When victory in Europe was announced, the Army Medical Department set a target of ninety days in which to get all of the sick and wounded Americans in the war theaters of Europe back to their homeland. We scored a bull's-eye on that target with the fine cooperation of the Army Transportation Corps and the Air Transport Command. Today there is not a battle casualty, who could safely be moved, left in Europe. Top priority was gained for evacuating the wounded by air, hospital ship, and Army transport. As a result, our hospitals at home have hit the peak in occupied hospital beds. That means that our doctors, nurses, technicians, and other hospital employees now have the heaviest patient load they have ever had.

Now let me assure you on another point. The Army Medical Department has planned for similar evacuation of the sick and wounded from the Pacific. There will be no delay in getting those patients back home. We have again been assured of high priority for their return by plane, hospital ship, and Army transport.

The Army Medical Department's primary purpose is to care for the sick and wounded soldier. All of its functions revolve around that aim. It is our responsibility to provide the best medical care for our soldiers that is available. That we have done. The medical records of this war speak for themselves. There are those who have said that we had too many doctors and nurses, just as others have said that we had too much ammunition and too many supplies. They will probably voice their opinions again with the coming of peace. In my opinion, you can't give the wounded man too much medical care.

The Army Medical Department has never had its full strength in medical officers authorized by Congress. By careful planning, and it had to be careful planning in a two-front war, our medical men have made a record in saving human lives from death and disease that has never been equaled by any army of any country in history. The man with a gaping wound in his chest appreciated the prompt medical attention he received. The man with a head wound and the man with his leg blown off appreciated the prompt medical attention they got. They are the men best able to judge whether or not there were too many doctors in the service. We amplified the efforts of our doctors with nurses, technicians, administrative officers, and that fine, brave group of medical aid men, who have achieved such high honors in this war.

We still need doctors. Our job isn't over. We will have a heavy hospital population in our hospitals here at home for the next six months. We will not need all the medical officers that we now have. Surplus medical officers are now being released on the point system as rapidly as they return from overseas theaters. But just as long as the soldier patient needs medical care, he is going to get it.

The officers, men, and women of the Army Medical Department have done a grand job in this war, and I am proud of them.

Major General, U. S. Army,
The Surgeon General.

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

A SUMMARY OF ESSENTIAL INFORMATION

The purpose of this special issue of The Bulletin is to summarize in one compact volume some of the newer developments and more important knowledge in the prevention and treatment of battle injury and disease. Much of this information has appeared in reports and documents of various kinds from time to time, but it has not always been accessible to all medical officers. For this reason, the pertinent facts with which medical officers should be acquainted have been collected in this convenient form by the professional divisions of The Surgeon General's Office for the guidance of all concerned.

HOW TO OBTAIN WAR DEPARTMENT PUBLICATIONS

Those War Department publications which are distributed by The Adjutant General, such as War Department TB MEDs, Bulletins, Circulars, General Orders, Field Manuals, Technical Manuals, and ASF publications, may be obtained by requisition on the sources given in War Department Field Manual FM 21-6 (List and Index of War Department Publications). Paragraph 24 (page 15) of this manual reads as follows:

"In continental United States, Army Ground Forces and Army Service Forces headquarters, offices, organizations, and activities may, on showing the need therefor, obtain any printed publication in reasonable quantities by requisitioning the post commander as prescribed in Circular 264, War Department, 1944. Army Air Forces headquarters, offices, organizations, and activities will submit requisitions as prescribed by the Commanding General, Army Air Forces.

"Headquarters, offices, organizations, and activities outside the continental United States will requisition publications in accordance with the procedure prescribed by the commanders of the theater, command, department, or base. Commanders of theaters, commands, departments, and bases overseas will submit requisitions for publications to the commanding general of the port of embarkation serving that area."

In addition to the channels of supply prescribed above, the following issues of TB MEDs may be purchased direct from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., at five cents each (those followed by an asterisk are ten cents each, and that followed by a double asterisk is fifteen cents):

TB MED 1, 9, 10, 11, 12*, 19, 21*, 22, 23*, 25*, 31, 35, 43, 44, 47*, 48, 48 Change 2, 53*, 60, 62, 65, 69, 71, 72, 74, 76, 76 Change 1, 78, 80*, 80 Change 1, 81, 82, 84, 85, 89, 91, 94*, 96, 97*, 99, 100, 101, 103, 104, 106, 110, 112, 114*, 115, 115 Change 1, 117*, 119, 121, 122*, 124, 127, 131, 133, 136, 137*, 138, 141, 142*, 143, 144**, 145, 147*, 148*, 151, 153, 155, 155 Change 1, 157, 158, 159, 162*.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

SURGERY

NOTES ON CARE OF BATTLE CASUALTIES

Certain broad policies and guiding principles on the care of the wounded in theaters of operations have been previously presented. Greater experience that has since accumulated has confirmed the soundness of these principles and has brought to light additional facts that indicate the need for re-emphasis of some of these principles and suggest the desirability of modifying others. They provide, also, the basis for certain new developments the significance of which demands their wider application. For these reasons and to assure continued improvement in the management of the wounded, this bulletin has been prepared for the guidance of all concerned. Certain details of the phases of wound management of especial concern to theaters of operations are outlined.

Fred W. Rankin, Brigadier General, U. S. Army, director, Surgical Consultants Division, The Surgeon General's Office.

General considerations. The care of the wounded must always be shaped by conditions and circumstances that govern the tactical situation at the moment. It is erroneous, however, to assume that the surgery of war is entirely molded by concessions to the need for haste and the confusion of caring for overwhelming numbers of patients. Military surgery is not to be regarded as a crude departure from accepted surgical standards, but rather as a development of the science of surgery to carry out a specialized and highly significant mission. Modern surgical treatment employs many adjuvants to operative techniques, such as chemotherapy, fluid replacement therapy, the transfusion of whole blood and fractions of blood employed as substitutes, potent anesthetic agents, and narcotics. These tools are as important to the military surgeon as his scalpel, but are equally dangerous to the patient if used without expert precision. A major responsibility of the military surgeon is to make full use of these and similar measures and at the same time to avoid the dangers that may attend their usage.

a. The ever-present necessity for evacuation of the wounded to the rear is in fundamental conflict with ideal surgical management of the individual patient. To minimize this conflict, *close coordination between the functions of administration and professional services is required.* It is the responsibility of the medical officer charged with the surgical management of the patient to place technical procedures properly, both in time and in space, with due regard to the tactical situation on the one hand and to the welfare

From TB MED 147, March 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

of the patient on the other. Unless the surgeon visualizes his position and the function of his hospital in relation to other surgeons and other hospitals, he may become confused in the mission he is to perform. Although some needed operation may be performed correctly, the military effort may be impeded and unforeseen harm done to the patient if the operation is done at the wrong time or in the wrong place.

b. It is the *responsibility of administrative officers* charged with the establishment of evacuation and hospitalization policies to adapt the schedules of movement of patients to the maintenance of highest standards of surgical treatment. Priority of movement must be accorded to patients with certain types of injuries just as the duration of hospitalization in a given zone must be differentially adjusted to the urgent surgical needs of the patients. The term "nontransportable" as relating to the unfitness of battle casualties for interhospital transfer must, when military necessity permits, be extended beyond actual danger to life by a consideration of the likelihood of deformity, ultimate disability, and delay of recovery when these hazards exist.

Phases of surgical management. Just as the placement of various types of hospitals and consequently the provision of the facilities for surgery are determined by the geographic deployment of a military force, phases of surgical management exist that in general will conform with military echelons. These phases of surgical management are: medical aid measures, initial wound surgery, reparative wound surgery, reconstructive surgery, and rehabilitation measures.

a. Medical aid measures. Within the divisional area, surgical management is limited to first-aid measures and emergency resuscitation. Hemorrhage is controlled, splints and dressings applied, morphine administered for pain, plasma infused for resuscitation, a booster dose of tetanus toxoid is given, and chemotherapy initiated.

b. Initial surgery. Actual conditions of warfare will determine both the facilities provided for emergency wound surgery and their location with reference to the combat area. In general, initial surgery is concerned with complete resuscitation so that surgery may be performed, and with surgical procedures designed to prevent or eradicate wound infection. Many of the seriously wounded casualties can be resuscitated only by a surgical operation in conjunction with transfusion and plasma therapy. For this reason, it is important that delays for the purpose of resuscitation ahead of an installation equipped for major surgery be kept at a minimum. Placement of the advance surgical hospital in physical proximity to the divisional clearing station accomplishes this end.

c. Reparative surgery. The general hospitals of the communications zone receive casualties from the hospitals of the forward area for further surgical management. As the initial wound operation is by definition a limited procedure, nearly every case requires further treatment. Soft part wounds, purposely left unsutured at the initial operation, are closed by suture, usually at the time of the first dressing on or after the fourth day. Fractures are accurately reduced and immobilized until bony union takes place. Designed to prevent or cut short wound infection either before it is established or at the time of its inception, this phase in the surgical care of the wounded is concerned with shortening the period of wound healing and seeks as its objectives the early restoration of function and the return of a soldier to duty with a minimum number of days lost. In addition, it affords the return of patients to the zone of interior at an earlier date and in better condition, and minimizes the ultimate disability and deformity in the seriously wounded. The success of this important phase of surgery depends on the provision of an adequate period of hospitalization in addition to com-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

petent surgical care, particularly in specialized fields. It is not to be confused with the reconstructive phase of surgery, which may be postponed until return to the zone of interior. The ideal time for the procedures of reparative surgery will be found between the fourth and tenth days after wounding. The patient then becomes "nontransportable" for a period of time which, in the case of fractures, may extend to ten or twelve weeks. Transfer of patients between fixed hospitals within the zone of communications must be regulated with these considerations in mind, otherwise the objectives of this phase of surgical management may be sacrificed. The establishment of special centers within general hospitals for certain types of surgery during this phase is highly desirable, as the procedures are oftentimes of considerable magnitude and call for mature and experienced professional judgment. Advancement of general hospitals in close support of Army or utilization of air evacuation from Army to more remote fixed installations are two measures that further the establishment of a program of reparative surgery. To use an oversea general hospital as a temporary custodial institution—a way station in a busy line of evacuation—where patients are held only if complications of the wound render them nontransportable, is to fail to utilize effectively and significantly one of the most highly integrated and specialized facilities of the medical service.

d. Reconstructive surgery. Early evacuation to the zone of interior is desirable for patients whose return to duty cannot be anticipated within the limits of the hospitalization policy of an oversea theater. The phases of reconstructive surgery and rehabilitation may then be integrated.

Medical aid measures. a. First-aid measures have been adequately treated in revised editions of War Department Technical and Field Manuals.

b. Recent developments in use of tourniquets in the field. (1) Tourniquet cases should have the highest priority in evacuation to the nearest hospital, and the presence of a tourniquet should be plainly indicated on the record.

(2) A tourniquet, such as the standard pneumatic type, ½-inch rubber tubing or rubber bandage, should be placed on an actively bleeding extremity only if the hemorrhage cannot be controlled by other means.

(3) The tourniquet should be placed as close to the site of injury in the thigh or arm as possible. If large defects are present in the extremity, care must be taken that the tourniquet is placed sufficiently high above the injury to prevent it from slipping down into the defect. Tourniquets about the forearm or leg are less effective, since bleeding from the incompressible interosseous vessels is difficult to control.

(4) Loosening of a tourniquet should be done under the supervision of a medical officer unless exceptional circumstances exist.

(5) At the end of about two hours, provided that the patient is not in shock and depending on the circumstances of the temperature, the tactical situation, and primarily on the judgment of the medical officer, the tourniquet should be cautiously loosened. If serious bleeding recurs, the tourniquet should be reapplied. If there is no bleeding or if only minimal bleeding results, the tourniquet should be removed, but the patient must be kept under observation for a reasonable period of time thereafter.

(6) A patient whose life is in danger due to shock from hemorrhage should not have the tourniquet removed within the first four to six hours after application unless the blood volume has been at least partially replaced by plasma or whole blood. After this period, loosening or removal of the tourniquet should be a matter for the surgeon's judgment. Where loss of the extremity is inevitable, the tourniquet should be left in place until guillotine amputation has been performed.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(7) Extremities with tourniquets applied should have the temperature lowered as much as feasible, short of actual freezing.

General principles of initial wound surgery. a. In the preoperative examination of a battle casualty, x-ray examination is essential.

b. Adequate assistance and instruments, a good light, and access to the wound that is unhampered by faulty position of the patient are basic requirements. Ample preparation of a wide field by shaving the skin will allow for extension of the incision or counterincision.

c. Bold incision is the first essential step in an operation on a wound. Adequate exposure is necessary to carry out *excision* of devitalized tissues. On the extremity the line of the incision is placed parallel with the long axis of the limb; elsewhere it follows the natural lines of skin structure. Only the devitalized skin of the margins of the wound is excised in a strip rarely wider than 2 to 3 mm. The creation of circular skin defects is avoided.

d. Incision and excision of the fascial layers are performed in the same manner to give free access to devitalized muscle. Unrestricted exposure of successive anatomic layers permits the complete excision of devitalized muscle and the removal of foreign bodies.

e. The surgeon must be familiar with the blood supply of muscles, particularly large groups, like the gastrocnemius-soleus muscles of the calf, and respect these vessels in his dissection. Deep recesses of the wound containing foreign bodies may be approached by counterincisions planned anatomically rather than by sacrificing normal muscle structures.

f. Use fine hemostats. Use the finest ligature compatible with the procedure. Include the smallest possible amount of tissue in ligating a bleeding point. Do not repeatedly bite the wound with tissue forceps. Sponge gently with pressure instead of wiping. Remaining devitalized tissue produced by the missile or by the surgeon must slough before the wound can be closed by secondary suture.

g. Large wounds in regions of heavy muscles, particularly when complicated by comminuted fracture, require especial care. The depths of these wounds must be opened by a long incision with counterincision if necessary to allow free *dependent* drainage.

h. Only enough dry fine mesh gauze (bandage, gauze, roller, Items Nos. 2005000 or 2006000) is used to separate the surfaces of the wound. It should be smoothly laid in the wound—not "packed."

i. Ether, white soap, and benzene have slight but definite necrotizing effects on living muscles. Green soap and various other substances used as detergents have greater necrotizing effects, whereas physiologic saline solution is relatively innocuous. In general, progress in wound management points away from the introduction of any chemcial agent into a wound for its supposed antiseptic effect.

j. Old wounds (forty-eight hours or longer) are managed in accordance with the same principles, except that, in selected cases of established pyogenic infection and anaerobic cellulitis with toxicity, the general condition of the patient to withstand radical surgery may be improved by immobilization, penicillin, and repeated blood transfusions until an optimum time is selected for intervention. In postponement of surgery, the advantage that accrues from the immediate drainage of septic hematomas, large masses of dead muscles, and fascial plane abscesses is not to be forgotten. Postponement of surgery is not justified if clostridial myositis (gas gangrene) should be present.

k. Proper transportation-splinting is provided for skeletal and joint injuries. Soft part wounds are supported by firm pressure dressings and may, if extensive, be advantageously inclosed in a light plaster. Care is taken to avoid any constricting action of a pressure dressing placed on an

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

extremity. Plaster casts must always be padded and split, or bivalved, before the patient is returned to the ward.

General principles of reparative wound surgery. a. On arrival at a hospital where bed care can be assured for a period of at least fifteen days (soft part wounds) the original dressing is removed in the operating room under aseptic precautions. X-ray films should be at hand. If the primary wound operation has been complete and has been properly done, all superficial wounds and many deep wounds may be closed by secondary suture at this time (four to ten days). Foreign bodies in soft parts adjacent to the wound are removed. Following suture, the part is immobilized, preferably by a light plaster, or if this is impractical, by bed rest.

b. The presence of residual dead tissue or established infection manifested by profuse discharge of pus, reddening and edema of the wound margins, persistent fever or toxicity is an indication for delay in secondary suture. When these manifestations are present but minimal, the wound is allowed to "clean up." This process can be hastened by moist dressings or by additional surgical excision of devitalized tissue remnants. Secondary suture can then be performed in a few days. If established infection is severe, or if the patient is toxic and anemic from deep-seated sepsis, a course of penicillin therapy and blood transfusions is instituted and followed by radical wound revision and staged closure.

c. Wounds that have been laid open properly at the initial operation tend to gape widely and give the impression of extensive skin loss. This appearance is actually due to loss of support of the deep fascia. Skin defects are more apparent than real in the majority of cases. Closure of a defect due solely to loss of skin is made from local tissue. Undermining with advancement or rotation of flaps provides sufficient skin in nearly all instances and is preferable to grafting.

d. Technical considerations that are important to the success of secondary wound closure are:

(1) Atraumatic handling of tissue.

(2) Avoidance of tension sutures.

(3) Accurate approximation of skin margins. The epithelial bridge is the main support of the wound for a considerable period of time.

(4) Obliteration of dead spaces by pressure dressings and immobilization. Stab-wound drainage may be instituted when desired and is preferable to drainage through the suture line.

(5) Leaving sutures in place for twelve days if stitch infection does not develop.

(6) Suture in straight lines rather than the creation of sharp angles.

e. Preliminary bacteriologic analysis of the flora of a wound does not provide information pertinent to making the decision to perform secondary suture or allow the prediction of the result. If the suture is not successful because of infection, appropriate studies and corrective therapy are instituted before resuture is attempted.

f. The conditions that most often jeopardize results are:

(1) Suture of a wound that is discharging pus. This usually means dead tissue in the depths.

(2) Too early motion. (Wounds breaking down for this reason should be immediately resutured.)

(3) Unrecognized foreign bodies adjacent to the wound.

Consideration of closed plaster treatment (methods of Ollier, Pirogoff, Orr, and Trueta). *a.* The regimen of closed plaster management of war wounds is not considered as satisfactory as the method described above, when field conditions permit the use of the latter. It is advisable to remove the initial dressing for inspection of the wound in all cases at least by the fifteenth day.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

b. While the necessity for the rapid turnover of large numbers of casualties might justify an adoption of the closed plaster method of management of compound fractures, a high penalty in the form of skeletal deformity would be the inevitable result. Results obtained by secondary suture do not justify the use of closed plaster for soft part wounds.

c. When it is desired to allow granulations to cover exposed bone in deep irregular wounds, the wound may be encased in plaster subject to infrequent changes. This is also an accepted method of management for established infection of bone, particularly when the wound has caused an extensive loss of overlying soft parts or there is a large bone defect. Before application of the plaster, all devitalized tissue and loose bone fragments are excised. There should be no pocketing or pooling of pus in the fracture site or adjacent fascial compartments. Small surfaces of bare cortical bone may be removed surgically when this permits closure of the defect by suture or skin graft.

Craniocerebral wounds. a. Deep infection of penetrating wounds of the skull is almost always associated with incomplete removal of devitalized brain substance. The extent of the necessary débridement is oftentimes indicated by indriven bone fragments which are demonstrable by x-ray examination. Stereoscopic roentgenograms are helpful. A reduction in the incidence of infection can be effected by extending the débridement so that *these fragments of bone and the tissue that surrounds them are removed* at the time of the initial surgical procedure.

b. Dura defects are repaired by living grafts of fascia or pericranium. The scalp is closed by suture.

c. When a patient arrives at the base following initial débridement and closure of the wound in the forward area, neurological changes are carefully noted. When compared with former observations these may suggest improvement or regression. Signs or symptoms of increasing intracranial pressure usually indicate deep wound infection, hematoma, or a mass of residual necrotic tissue. The tension and healing in the scalp flap and wound are at once determined. Should stereoscopic x-ray studies disclose the presence of residual bone fragments, secondary wound débridement can then be more readily directed. Even in the absence of symptoms it is usually wiser to remove large or clustered bone fragments. On the other hand, if the fragments are small or in a dangerous location, operation may be withheld, provided the patient is doing well and can be held for a period of observation. If secondary operation is to be carried out, necrotic or infected tissue and hematoma are removed and wound closure effected, even though frankly purulent cerebritis has been encountered. At times a temporary drain to a large dead space is permissible, or repeated aspirations employed, but only rarely is it necessary to exteriorize the infected area.

Eye injuries. a. Conservation in the enucleation of eyes in forward installations is advisable. Inasmuch as sympathetic ophthalmia never develops before ten days and usually not before two weeks after the initial injury, the first two weeks following the injury may be considered the "safe period." Therefore, in forward installations enucleations should be done only when there is extensive damage to the eye and orbit, and removal of the ocular remnants is a necessary procedure in the débridement of the the area. Enucleation with a glass ball implant in Tenon's capsule is the operation of choice. Evisceration should be limited to those cases showing a purulent endophthalmitis.

b. Pending enucleation, or while awaiting the repair of an eye injury, the injured eye is atropinized, ophthalmic ointment applied, and both eyes bandaged. The immobilization of both eyes is particularly important, as movement of the eyes is minimized with lessening of the danger of wound gaping and further prolapse of the intraocular tissue.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

c. Every case of perforating injury is x-rayed as soon as possible to determine the presence or absence of an intraocular foreign body. Patients suspected of having an intraocular foreign body are best transferred to an installation where a giant magnet and accurate methods of x-ray localization are available. The removal of an intraocular foreign body should be attempted as soon as possible unless an established iridocyclitis is present.

d. Tarsorrhaphy is indicated in certain cases for protection of the eyeball during evacuation. The lids should be sutured together whenever there is serious injury or burn of the eyelids, or an exposed eyeball. This is accomplished in most cases by "freshening" the nasal and temporal lid margins and sewing the lids together with fine silk. Where there is much destruction of one of the eyelids, the other can often be brought up to cover the eye. If both lids are destroyed, the eye should be covered by a skin flap as a temporary measure.

Maxillofacial wounds. *a.* The hazards to life of initial operative management are oftentimes greater than those of the original wounding. There should be no hesitancy in performing tracheotomy when indications exist to relieve obstruction of the airway by that method. On the other hand, the care of a tracheotomy is difficult in a long evacuation line, frequently requiring a personal attendant. The choice of the anesthetic agent, as well as the techniques of its administration, requires expert judgment and skill.

b. The procedures of initial surgery are based on the following principles in order of importance:

(1) Reduction and fixation of fractures of the bony foundation structures. This may be by temporary measures for transportation purposes, with the intent that it will be replaced by more elaborate and precise splinting at a rear installation.

(2) Isolation of the buccal cavity from the wounds of the bone and superficial soft parts by suture of the mucous membrane.

(3) Primary closure of the muscles and skin with provision for adequate drainage in anticipation of infection. If the defect is such that primary closure is not possible and the wound enters the buccal cavity, the edges of the skin and mucous membrane should be carefully approximated.

(4) Application of moist pressure dressings.

c. The management of the soft part wound by primary suture, with or without plastic repair, must not tempt the forward surgeon to hold a patient for supervision of healing, with the result that precise and firm splinting of the bony parts is postponed.

d. Those cases with severely comminuted fractures or loss of bony substance, and with major soft tissue defects, require evacuation to the zone of interior as soon as they can care for themselves and after the dangers of infection have passed.

Thoracic wounds. *a.* It is important to recognize two distinct phases that may be encountered in chest wounds: disturbance in cardiorespiratory physiology, and infection. The former develops immediately; the latter is usually delayed. Accordingly, in the forward area efforts are directed toward the restoration of physiologic equilibrium, whereas the less urgent complication of infection, if it occurs, may be controlled adequately at the base. Thus, success in the management of penetrating wounds of the chest depends upon the judicious timing and selection of surgical measures.

b. Occlusion of open chest wounds with gauze and adhesive strapping is the preferred management until the patient reaches a hospital staffed and equipped to carry out intrathoracic surgery.

c. Patients with a chest wound suffering from shock may be more advantageously treated in the prone position with the foot of the litter elevated than in a sitting position. Control of urgent physiologic disturb-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ances that attend wounds of the chest in both preoperative and postoperative periods can be achieved by—

(1) Needle aspiration of air and blood. Early and repeated aspiration of hemothorax without air replacement is essential in the proper management of chest wounds.

(2) Bronchoscopic or catheter aspiration of blood and mucus from the tracheobronchial tree.

(3) Infiltration of the intercostal nerves with procaine hydrochloride solution for relief of chest wall pain. This enables the patient to cough effectively and clear the air passages of blood and secretions.

(4) Insertion of a catheter with a flutter or water-seal valve for pressure pneumothorax.

(5) Administration of oxygen and whole blood transfusion. Autotransfusion of pleural blood should be used when practicable. Care is taken to give the blood slowly in resuscitation after the systolic blood pressure has reached 80 mm. of mercury, and the total amount administered should be only that essential to attain adequate resuscitation.

(6) Débridement of sucking wounds, with hemostasis of intercostal vessels and approximation of deep structures of the chest wall to close the pleural opening.

d. An anesthetist well trained in endotracheal anesthesia for thoracic surgery is an essential member of an operating team caring for war wounds of the chest. Endotracheal oxygen-ether, administered through a closed apparatus capable of maintaining positive pressure, is the form of anesthesia recommended in the management of penetrating and perforating chest wounds.

e. Early thoracotomy through an extension of the wound or by a separate incision at a site of election, is indicated in the presence of—

(1) Continuing intrapleural hemorrhage not controlled by hemostasis in the chest wall débridement.

(2) Anatomic likelihood of diaphragmatic penetration.

(3) A missile in the mediastinum or that has traversed the mediastinum with evidence of visceral damage.

(4) Large intrapleural foreign bodies or debris that is readily accessible by extension of the wound.

(5) Wounds of large bronchi or the intrathoracic portion of the trachea.

f. The following conditions are not in themselves indications for early thoracotomy either by extension of the wound or by separate incision:

(1) Foreign bodies; that is, metallic fragments, rib fragments in the lungs, or small fragments that may be in the pleural space.

(2) Hemothorax. (Evacuation of blood from the pleural cavity by suction at the time of chest wall débridement is not considered a thoracotomy.)

(3) Lacerated or contused lung, unless there is definite evidence of continuing hemorrhage.

g. The incision for thoracotomy, or an extension of the wound, should be placed in the posterolateral area of the thoracic cage, rather than anteriorly. Difficulty has been encountered with the breakdown of anterior chest wall defects. Following thoracotomy, closed drainage of the pleural space is instituted unless definite contraindications exist. The drainage catheter is removed as soon as the clinical course permits, usually at the end of forty-eight hours.

h. Rather than invite pulmonary edema by excessive intravenous fluid therapy, it is advisable to keep a patient with an injured lung slightly dehydrated.

i. Late complications include residual "clotted" hemothorax and empyema.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(1) The accumulation of massive clots of fibrin in the pleural cavity is suspected when clinical findings persist and only small amounts of blood can be withdrawn with the needle. In addition, serial roentgenograms show no improvement during the third to sixth weeks. In such cases thoracotomy is done for the removal of clots from the pleural cavity and the dense layer of fibrin from the underlying lung. Early decortication in these cases permits normal expansion of the lung and prevents chronic empyema and other complications that lead to chronic disability. Penicillin is used both systemically and locally in the pleural cavity at the time of operation.

(2) Empyema complicating hemothorax demands prompt surgical drainage or, when the patient's condition permits, radical thoracotomy with the evacuation of residual clots and decortication of the lung. The latter procedure should be performed preferably before the tenth week, because the surgical line of cleavage becomes obliterated after this time by organization of inflammatory exudate. Systemic and local penicillin is used as an adjuvant.

Abdominal wounds. a. Resuscitation. Surgical management of penetrating wounds of the abdomen demands rapid resuscitation with adequate amounts of whole blood and plasma and early operation. Continuing internal hemorrhage or advancing peritonitis frequently prevents a satisfactory response to blood transfusion, forcing the surgeon to proceed with operation and rely on support of the patient by transfusion during and after surgery.

b. Preoperative measures. Nasogastric intubation, with removal of gastric contents, is an important measure to prevent the aspiration of this material during anesthesia. It is a fortuitous event when passage of the tube provokes vomiting. Testing of the nerve function of the extremities and rectal examination to detrmine the presence of fresh blood indicative of injury to the rectum are the two most commonly overlooked features of the preoperative examination.

c. Anesthesia. Ether-oxygen anesthesia with a closed system, and preferably with an intratracheal tube, is the method of choice. Supplemental block of the field either by local infiltration or injection of the lower intercostal spaces in the axillary line may minimize the necessity for carrying these patients into the deeper levels of general anesthesia. Facilities should be available for bronchoscopy during or subsequent to the operation if there is reason to believe that gastric contents have been aspirated into the tracheobronchial tree. Postoperative aspiration pneumonia ranks with peritonitis as a life-endangering complication.

d. Incisions. The vertical paramedian incision affords the most useful approach and is least liable to complications. Fecal contamination of the peritoneal cavity will be reflected by postoperative infection of the abdominal wall incision in a considerable number of instances. The principles that apply to the management of heavily contaminated soft part wounds also apply to abdominal wall incisions, provided steps are taken to prevent evisceration. The peritoneum is closed, usually including the posterior rectus sheath in the suture line. The rest of the abdominal wall is loosely approximated, preferably with stay sutures of braided silk or wire. The skin is left unsutured. The provision of adequate drainage for the abdominal wall incision, the avoidance of buried sutures and ligatures, and a loose rather than taut approximation of the stay sutures are the most effective measures in the prevention of infection. When it is necessary to exteriorize segments of bowel or to provide intraperitoneal drainage for or in anticipation of localized sepsis or a fecal fistula, secondary incisions are made. These are short, laterally placed incisions that follow the direction

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

of the fibers of the external oblique muscle. In the upper abdomen, incision for exteriorization of bowel must not impinge on the costal arch.

e. Small bowel injuries. Depending upon the extent of damage, repair is done by suture or by resection and anastomosis. Exteriorization of small intestine or double-barreled enterostomy is avoided as productive of serious life-endangering complications.

f. Large bowel injuries. It is important to note the distinction between exteriorization of a wounded segment of bowel and construction of a colostomy to divert the fecal stream. At times both purposes may be accomplished by one and the same procedure, but a clear understanding of the purpose of the operation is essential to the selection of techniques involved. For either purpose the basic technical requirement is adequate mobilization of the segment of the large bowel that is brought to the surface of the abdominal wall. Insufficient mobilization with dependence upon suture or clamps to maintain the bowel in its abnormal position will result in retraction. Retraction leads to a fecal fistula that may be difficult to repair or, in the case of a defunctioning colostomy, defeats the purpose of the operation by allowing fecal matter to enter the distal segment. Early in the convalescence, retraction is productive of abdominal wall infection or intraperitoneal sepsis.

(1) ***Exteriorization.*** Exteriorization of the damaged segment through a laterally placed muscle splitting incision is the established procedure in the management of wounds of the large intestine. The loop of bowel must lie comfortably on the abdominal wall without tension and with proper orientation of its proximal and distal limbs; that is, not twisted upon itself. The mesentery falls naturally into a fold on the medial aspect of the loop, leaving the bowel walls in contact on the lateral side. Properly performed, this simple procedure is adequate in the majority of instances when exteriorization is all that is required. Closure is made by suture or the application of a spur clamp in the area when the two limbs of the bowel are in contact. When the injury is larger than one-half the diameter of the bowel or a segment has been resected because of damage to the mesentery, exteriorization takes the form of a double-barreled spur. Sutures may be placed to approximate the antemesenteric borders of the intraperitoneal portions of the limbs for subsequent crushing by a clamp. Care must be taken not to penetrate the lumen of the gut or strangulate vessels by sutures.

(2) *Sigmoid colostomy.* Colostomy to divert the fecal stream is required for: injuries of the pelvic colon below the level where exteriorization is possible (in such an instance the perforation is repaired by suture and proximal colostomy done); wounds of the rectum; and certain perineal and buttock wounds as an adjuvant to wound healing and secondary suture. An appraisal of the length of time that may be necessary to defunction the distal bowel segment guides the technical details of construction of the colostomy, as well as determines the site chosen for the artificial anus. A tube cecostomy or partial exteriorization of the cecum does not divert the fecal stream from the remainder of the colon, and is never used for this purpose. Colostomy in the left half of the transverse colon is a useful procedure in the face of extensive pelvic injuries that may require subsequent repair by the abdominal route. This is particularly the case if a suprapubic cystostomy is also indicated, or if the missile has produced damage to the abdominal wall in the left lower quadrant. Usually, however, a left sigmoid colostomy will be satisfactory for injury of the pelvic colon or rectum and for perineal injuries. Placement of the colostomy in a defect produced by the missile, or in the laparotomy incision, is to be avoided. Formation of a loop with proper lateral orientation of the bowel, assured if desired by the

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

placement of a few absorbable sutures on the antemesenteric borders or approximation of appendices epiploicae, provides an adequate sigmoid colostomy. Formal construction of a long spur is not necessary and may be undesirable. Extensive damage to the lower bowel segment, associated injury of the bladder and urethra, and wounds that extensively compound the bony pelvis, as well as the rectum, are examples of injuries that require a prolonged and complete defunctioning artificial anus. Under these circumstances the exteriorized loop is made sufficiently long to allow for complete transverse section of the bowel and some separation of the two stomata. As ultimate closure will be by end-to-end suture, formation of a spur is undesirable. Construction of a skin bridge between the arms of the loop would, in fact, be preferable. Small perforations of the rectum, or instances in which the perforation cannot be demonstrated but is thought likely, may not require prolonged or even complete diversion of feces. Small wounds of the rectosigmoid may heal promptly if suture is technically satisfactory. Under such circumstances, formation of a loop colostomy with a tentative partial opening on the antemesenteric border will suffice until a complete appraisal can be made at a fixed hospital. Many of these cases can be restored to duty within an overseas theater by extraperitoneal repair of the incompletely divided loop. If the need for long and complete diversion of feces is demonstrated, the loop is completely transected to form an artificial anus. Colostomy as an aid to the healing of wounds of the buttocks and perineum need not be performed in the forward area unless laparotomy is being performed for other purposes. If done solely for management of the external wound, the patient will be rendered nontransportable because of a procedure that could have been postponed until arrival at a fixed hospital.

(3) *Cecostomy.* Tangential perforations of the cecum may be managed by a tube cecostomy or, preferably, by exteriorization. Single perforations require mobilization of the bowel to look for retroperitoneal perforation. Cecostomy, even when necessary because of direct injury to the cecum, is never to be used as a substitute for a proximal colostomy when indications for the latter are present.

(4) *Right colostomy.* In extensive injuries necessitating resection of the cecum and ascending colon, the most important principle to observe is complete separation of the ileostomy from the laparotomy incision or from a large abdominal wall defect. The most satisfactory method for dealing with the end ileostomy is separation of the ileum and the proximal end of the colon by creating a terminal ileostomy in a separate incision in the right lower quadrant and exteriorization of the end of the colon below the costal margin. Every effort should be directed to the early anastomosis of the ileum to the transverse colon.

(5) *Perforations of rectum.* Wounds of the rectum are characterized by inaccessibility, difficulty of diagnosis, frequent damage to other structures, and the hazard of pelvic and ascending retroperitoneal cellulitis. Deviations from the principles established for the management of wounds of the rectum continually lead to serious complications. Colostomy (not cecostomy) is mandatory, as also is free posterior drainage, best established by incision of the fascia propia exposing the rectal, sacral, and lateral paramedian spaces. Attempts to drain the retroperitoneal space by utilizing the missile wound of the buttock have been disastrous. In establishing posterior drainage it may be desirable to increase the exposure by removal of the coccyx. This is done as a disarticulation of the coccyx from the sacrum by sharp dissection and erasure of exposed articulating cartilage—not by incomplete amputation with a bone forceps.

g. Postoperative care. The postoperative care of patients with abdominal wounds is of the utmost importance and is the personal responsibility

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

of the operating surgeon. Among the most important considerations are:

(1) Holding of the patient until his equilibrium is established, oftentimes a minimum of ten days.

(2) Nasogastric suction for forty-eight hours or more following operation.

(3) Whole blood and plasma.

(4) Parenteral fluid therapy is controlled by measurement of fluid intake and output and by determinations of cell volume and plasma protein concentration by the copper sulfate method. A daily urinary volume of 1,200 to 1,500 cc. is maintained, a point of particular importance in connection with the use of sulfadiazine.

(5) Aspiration of tracheobronchial secretions. Postoperative pulmonary complications including pneumonia, atelectasis, and pulmonary edema are common in this group of patients. Oxygen therapy by means of an indwelling nasal catheter and aspiration of tracheobronchial secretions by catheter or bronchoscope are important measures and may be required frequently.

h. *Postoperative complications.* In cases that develop sepsis, small intestinal fistula, intestinal obstruction, and other complications or sequelae, it is essential to—

(1) Maintain nutrition by supplemental feedings.

(2) Correct the tendency toward vitamin depletion.

(3) Promptly diagnose and drain localized sepsis.

(4) Close small intestinal fistulas at the earliest moment that operative intervention can be tolerated.

i. Closure of colostomy. A defunctioning colostomy deteriorates into a useless fecal fistula when it no longer diverts the feces from the distal bowel. Reappraisal of the purpose of its continuation must be made and it should either be closed or re-established as an effective artificial anus. Spillage of feces into the lower segment results in fecal impaction and delays healing of the wound of the bowel wall. In oversea theaters it is desirable to close certain colostomies and repair exteriorized segments, when this can be done, by suture of a partial defect of the bowel or by crushing a spur. Formal end-to-end suture is not recommended for oversea theaters unless the patient can be returned to duty in the theater.

Peripheral vascular injuries. Peripheral vascular injuries are of special importance, particularly where major vessels are involved. In many of these cases ligation or end suture will be necessary. Ligation in continuity should not be done. In the presence of thrombosis, the thrombosed segment is excised. Localized segmental spasm of the artery should be distinguished from thrombosis. Such cases, also termed "concussion" or "stupeur" of the artery, may follow various forms of trauma to an extremity, especially when the traumatizing agent passes near a vessel. In such cases the limb is cold, pale, and pulseless, but evidence of hemorrhage or hematoma indicating that the vessel has been lacerated is lacking. These cases respond well to débridement of surrounding traumatized tissue and to periarterial sympathectomy or sympathetic block. Postoperatively, in all cases with peripheral vascular injuries, vasodilatation may be induced by daily sympathetic block using 1 percent procaine hydrochloride solution. Body warmth is carefully maintained but heat should not be applied to the involved extremity.

a. The *position of the extremity* is important, as elevation may accentuate ischemia. A dependent position is preferable even if a moderate degree of edema appears to be the result. A plaster cast on an extremity threatened by ischemic gangrene is bivalved and the anterior half removed. Continuous observation is essential to detect impending anaerobic infection.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Repeated transfusions to establish a normal blood volume and maintain a high red cell volume is an important phase of management.

b. A patient with *impending ischemic gangrene* should be held at the initial surgical installation until a favorable result is assured or amputation is performed.

c. Operation for the extirpation of an *aneurysm* or an *arteriovenous fistula* is rarely an emergency procedure. Since wounds causing aneurysms may be infected, and since extravasation of blood into the tissues surrounding the wound usually occurs, delay in operation will diminish the chance of secondary infection and secondary hemorrhage. Moreover, *operation should be postponed until such time as collateral circulation has been established, so that major vessels may be safely ligated and divided.* This will usually require three or four months. Early operations are undertaken not for the cure of aneurysm but to arrest certain complications; namely, hemorrhage, impending rupture, nerve paralysis caused by pressure, or threatened gangrene of the extremity. In such cases, repeated sympathetic block using 1 percent procaine hydrochloride solution (or sympathectomy, if indicated) should be done both preoperatively and postoperatively to assure maximum vasodilatation and thus increase circulation in the involved part. Oversea patients with aneurysms should be evacuated to the zone of interior where, upon arrival, they should be sent to vascular surgery centers in accordance with paragraph 1*k* and 3*c*, War Department Circular No. 140, 1944, and War Department Circular No. 235, 1944.

Peripheral nerve injuries. a. Complete palsy with anatomic division of nerve. (1) *Primary suture* of peripheral nerve injuries is advisable only during a period when small numbers of casualties are being handled or expected. In selected cases of soft part wounds uncomplicated by extensive muscle damage or skeletal fracture, complete or partial severance of a nerve may be repaired by formal suture following a meticulous initial débridement. Closure of the soft parts over the suture line without tension is advisable with primary or staged closure of the skin. This procedure should be undertaken only if the patient may be held under observation of the operating surgeon for a period of ten days, and is not recommended if the wound is heavily contaminated by debris or if evacuation from the field has been delayed. Primary nerve repair must never be undertaken at the expense of delay in débridement or neglect of concomitant injuries.

(2) The *more usual method of management* will be by undertaking formal nerve suture as a phase of reparative surgery in the following stages:

(*a*) It is the responsibility of the surgeon at the time of the initial débridement to make a careful record of the injury as he observes it. Preoperative appraisal of nerve injury is notoriously difficult and inexact in patients with multiple wounds, particularly if they are suffering from shock. The most precise information comes from anatomic observations at operation. Here again, it is not desirable to embark upon a painstaking dissection with extension of the field of operation beyond the zone of devitalized tissues.

(b) No attempt is made to repair the nerve by suture or to fix the nerve ends. Exposed nerves are covered with muscle so that the dry fine mesh gauze used in the wound is not in contact with the nerve. Petrolatum gauze is not recommended.

(*c*) Dusting of the wound with sulfonamide after débridement should not be done in the area of the nerve trunk.

(*d*) The joints above and below the point of injury are immobilized to minimize retraction of the nerve.

(*e*) A firm pressure dressing supported by a light plaster of paris cast is applied to reduce wound exudation.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(*f*) Penicillin therapy is maintained by the systemic route.

(*g*) On reaching a general hospital the original dressing is removed under aseptic precautions in the operating room. This usually is possible on or shortly after the fourth day after injury. Appraisal at this time is based upon the ultimate functional restoration of the extremity, taking into consideration muscle damage and bone or joint lesions in relation to the nerve injury. Electrical tests may be made if desired. Oftentimes a more deliberate examination will correct or supplement the initial notes made in the forward area. Procedures such as muscle suture or even shortening of the limb by removal of the devitalized comminuted bone fragments may be carried out at this time. The divided ends of the nerve may be approximated by a single fixation suture or otherwise identified with metallic sutures. The wound is closed if sepsis is not present, or if, after further excision of sequestrating tissue, the wound appears adequately prepared for closure. Closure of the skin may be further staged, or, if a large skin defect exists, a skin graft is applied at once, or as a staged procedure.

(*h*) When first intention healing has been secured—and this results in 80 to 95 percent of cases—formal suture of the nerve is performed under the protection of systemic penicillin. This should be feasible in many cases during the third or fourth week after injury.

(3) Patients with major nerve injuries, whether suture has been performed or not, should be transferred to the neurosurgical centers in the zone of interior with the least possible delay. It is important that splints or casts be removed at the earliest possible date. Cases are being received in the zone of interior with muscle atrophy and joint fixation resulting from unduly long periods of immobilization by casts.

b. Partial or transient palsies make up perhaps one-fourth to one-third of the nerve lesions arriving at the base. Recovery from simple contusion often begins within a few days, while more extensive injuries may proceed over a much longer period of time. In these cases it is desirable, though not imperative, to visualize the injury to the nerve trunk at the time of primary débridement or secondary wound suture.

Amputations. The most important phase in the management of amputations is the functional rehabilitation of the patient by the fitting of a prosthesis. Amputation centers have been established in the zone of interior for this purpose. It is the expressed desire of The Surgeon General that the early management of amputations in overseas theaters conform with policies that have been set forth in numerous bulletins and circular letters.

a. In the forward area, amputations will be performed at the lowest possible level except that a proximal amputation may be done in preference to a disarticulation. The technique for the performance of amputations is as follows: An incision is made through the skin at the lowest level compatible with viable tissue, and the skin allowed to retract; the fascia is then incised at the level to which the skin has retracted. The superficial layer of muscle is then cut at the end of the fascia and permitted to retract. At its point of retraction, the deep layers of muscle are cut through to the bone. After the deep muscles have retracted, the periosteum of the bone is cleanly incised and the bone sawed through flush with the muscles. No cuff of periosteum is removed as in a closed amputation. Bone denuded of periosteum will sequestrate if infection is present, and a ring sequestrum often results when the periosteum has been removed. It is important also that no periosteum be elevated or torn from the bone in the stump by rough handling. The stump following a properly performed open amputation exhibits a slightly concave open cross section of the extremity and the skin can be pulled down gradually by traction to cover the end of the stump.

b. The proper dressing of the stump is important. The end of the stump is dressed with fine mesh gauze in such a manner that it does not

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

overlap the skin edges. Skin traction is applied immediately by a stockinet cuff attached with Ace adherent or by adhesive tape. Traction is obtained preferably by a light plaster cast incorporating a wire ladder banjo splint. The cast always incorporates the joint above the amputation; for example, a spica for an amputated thigh. The Army hinged half-ring splint may be utilized as an alternative. Medical supply Item No. 3661400, Cord, elastic, for traction, is available and is preferable to plasma tubing for the elastic traction. Before evacuation, the traction is examined, and, if doubt exists as to its effectiveness, it is reapplied. The tension of the elastic cord should be maintained by adjustment during transit.

c. At the base areas, skin traction is continued until the stump is healed or the case is evacuated. Closure of stumps by sliding flaps, plastic resection with sacrifice of bone length, or formal reamputation are procedures to be carried out in the amputation centers in the zone of interior rather than in an oversea theater. Skin grafting in lieu of traction is not indicated. Vertical incisions in the stump made for control of infection or as part of the initial débridement should be closed by secondary suture while skin traction is being maintained to cover the defect at the end.

d. In the communications zone continuous skin traction is maintained in all cases. After removal of the cast or splint, maintenance of traction using 4 to 6 pounds in below-knee and 6 to 8 pounds in thigh stumps over a pulley at the foot of the bed is indicated. Traction is continued until maximum healing of the wound is obtained. Traction in similar fashion is indicated in upper extremity amputations. Priority air evacuation to the zone of interior should be available for amputation cases as soon as they are able to be transported. Traction during evacuation is the same as in *b* above. Patients with injuries requiring amputation will benefit by the explanation of why the amputation is necessary, prior to the operative procedure. They should be informed further that additional surgical treatment of the extremity will be required before fitting the prosthesis.

Compound fractures. The management of a compound fracture is divided into the following phases: first-aid splinting in the field; débridement and the application of transportation splinting in a mobile hospital; final correction of the deformity and attainment of wound healing and bony union at a fixed hospital (reparative phase); reconstructive or corrective surgery (bone grafting, osteotomy, sequestrectomy, etc.) in the zone of interior. In every phase attention is directed to the *ultimate function of the extremity* which is dependent on muscles, nerves, blood vessels, and joints, as well as on skeletal integrity.

a. Transportation splinting applied subsequent to initial wound surgery for evacuation from mobile to fixed hospitals is not designed to provide anatomic reduction or prolonged fixation in suitable reduction. Except in rare instances it is by plaster of paris. Plaster bandages are adequately padded and bivalved or split through all layers to the skin. Skeletal fixation by the incorporation of pins or wires into the plaster is not recommended. The only indication for the use of internal fixation in the forward area is to preserve the vascular integrity of the extremity. Methods of transportation splinting that have proved safe and comfortable are:

(1) *Femur.* A low-waisted "one and one-half" double plaster spica with the knee slightly flexed and minimal abduction. The Tobruk plaster and the Army leg splint with skin traction provide temporary immobilization for transportation over short distances. While not as effective or comfortable as a spica, they may be used as emergency measures or when large numbers of casualties demand concessions to operating time, or for special indications such as the presence of a colostomy or suprapubic cystostomy. When restricted to lower third femoral fractures or knee joint injuries, the Tobruk splint provides adequate immobilization.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(2) *Humerus.* Comfortable and effective splinting is provided by a thoraco-brachial plaster with the arm forward in internal rotation or a plaster Velpeau bandage binding the arm to the trunk. The Army humerus splint designed for field (first-aid) use is not designed for postoperative transportation splinting. A hanging cast is both uncomfortable and ineffective as a method of transportation splinting.

(3) *Forearm.* A splint or bivalved circular plaster cast that extends to the midbrachial region with flexion of the elbow or a plaster slab in the form of "sugar tongs" is recommended. The forearm should be held in midpronation.

(4) *Tibia and fibula.* A split or bivalved circular plaster cast should be applied from toes to groin. The knee is slightly flexed (15 degrees), and the foot held in neutral position at 90 degrees to the axis of the lower leg.

(5) *Notes on immobilization of lower extremity.* Hyperextension of the toes should be avoided. If a plaster toe piece is used, it should be extended in line with the sole and should not be pushed upward. Where active toe motion is possible, a loop of wire or loop of plaster is preferred to the solid toe piece, since it will prevent pressure on the toes and at the same time permit active exercise. The ankle should be placed in a neutral position. Equinus position is not common, but when it does occur, the resulting disability is difficult to overcome. Flexion of the knee should be kept to a minimum. There is some disagreement on this point since flexion is often required to prevent rotation of fragments. However, persistent flexion of the knee is difficult to correct and interferes with function and therefore only slight flexion should be provided. Injuries involving the hip require immobilization in the optimum position of function in view of the danger of ankylosis. In the adult this position is approximately 15 to 20 degrees' flexion, 0 to 5 degrees' abduction, and neutral or slight external rotation comparable to the normal extremity. Since flexion deformity tends to progress, it is advisable to maintain very slight or no flexion during the early period of treatment. Patients should be instructed in static muscle contraction which can be performed under plaster in many cases. This will facilitate recovery.

b. Reparative surgery of compound fractures (cf. "Consideration of Closed Plaster Treatment," paragraph *c*, page 250). Reparative surgery in compound fractures is made necessary by leaving unsutured the large incisions made for débridement and the recognized fact that splinting suitable for transportation is inadequate for complete reduction and fixation of the fracture. The goal is functional restoration of the extremity and demands treatment of muscle and nerve injury as well as skeletal damage. Observance of certain basic principles is important to the success of this phase of management.

(1) *Preoperative correction of anemia by whole blood transfusion.* Despite whole blood transfusion for resuscitation in the forward area, a high percentage of compound fracture cases will arrive at a fixed hospital in the communications zone with low red cell volume (hematocrit) and hemoglobin. An approximate estimate of the quantity of whole blood needed to restore red cell volume may be deduced from the rough rule of 500 cc. blood for each 3 points of the hematocrit or 0.9 gram of hemoglobin. In the use of whole blood transfusion for correction of secondary anemia or hypoproteinemia the total volume administered in a twenty-four-hour period should not exceed 1,000 cc., except to replace blood lost at operative procedures. This is in contrast with the larger volumes that are administered for resuscitation when the total circulating blood volume may be greatly reduced. No correlation exists between the hematocrit or hemoglobin levels and circulating blood volume, and care must be taken not to precipitate pulmonary edema by overtransfusion of a patient in whom the blood volume

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

has been restored by dilution but who still shows a greatly reduced cell volume (hematocrit) and hemoglobin.

(2) *Surgical elimination of residual necrotic tissue.* No available chemotherapeutic agent can "sterilize" an open wound containing devitalized tissue or blood clot. A properly managed clean wound requires no local antiseptic.

(3) *Control of invasive infection by systemic chemotherapy.* Systemic penicillin therapy in a dosage of 25,000 units every three hours is recommended as a routine adjuvant for secondary operations on compound fractures. Treatment is continued postoperatively until the likelihood of invasive infection is passed.

(4) *Reduction or closure of soft tissue defects.* Exposed cortex of bone, nerves, and tendons are vulnerable to the necrotizing effect of wound suppuration and are protected by the apposition of adjacent soft parts. Transversely divided important muscle groups are united by suture. Fascial compartments are restored, to minimize scarring and improve muscle function. Certain of these procedures may be staged operations. Emphasis should not be placed on early or complete skin closure, as in most cases any remaining cutaneous defect will heal before bony union occurs.

(5) *Provision of drainage for residual exudate.* Severely comminuted fractures may require dependent drainage in association with the apposition of soft parts over exposed bone. Fascial plane incisions and separation of muscle bundles with fine mesh gauze to exteriorize the fracture site have proved superior to stab wounds or rubber drains. Upper extremity fractures rarely present a drainage problem. The thigh may be drained by a posterolateral incision between the vastus lateralis and the biceps. An adequate posterior drainage route for the shaft of the tibia does not exist and such an injury may necessitate a period of nursing in the prone position ("on the face").

(6) *Internal fixation of battle fractures* is not feasible commonly because of extensive comminution. Further, the method demands periosteal stripping and surgical trauma to the wound. Limitation of the use of this method to cases carefully selected by specialists fully experienced in the techniques and hazards of its usage is strongly advised. An example of sound usage is the employment of screws for restoration of the articular surface of a major joint. Reduction of the fracture—not the use of internal fixation—is a part of the goal of reparative surgery.

(7) *Use of suspension traction.* The application of suspension traction in the treatment of fractures, particularly those of the femur, is the safest and most satisfactory method of management. In fixed hospitals, fractures of the femur should be treated by skeletal traction for ten to twelve weeks, until enough union has been obtained to permit safe transportation to the zone of interior in a plaster spica. The use of suspension traction promotes the maintenance of joint and muscle function and prevents angulation or overriding deformity. Overpull and resulting distraction must be avoided at all times, particularly in cases associated with injury or division of the thigh muscles. Certain cases of this type require very expert attention and delay in the application of traction until firm fibrous union of muscles has been attained by suture.

Joint injuries. Early complete débridement is the keystone of success in the management of wounds that compound a joint. The wound of the soft part is excised and the bone and cartilage damage assessed through incisions that provide complete exposure. Comminuted fragments of bone and cartilage are removed from the joint and a careful search made for foreign material. When it is necessary for badly comminuted fractures of the patella to be excised completely as a step in the débridement of a knee

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

joint wound, every effort should be made after cleansing the joint cavity to close the capsule and to approximate the fibers of the quadriceps and patella tendons. The skin is left unsutured. Penicillin is inserted into a joint at the end of the operation. In joints that are accessible to needle aspiration, accumulating exudate may be withdrawn and penicillin injected during the postoperative period.

a. Closure of the joint is especially difficult in the face of extensive loss of soft parts. When it is impossible to close a joint by suture of synovia or capsule, an occlusive dressing is applied. On arrival at a fixed hospital, effort is directed toward closing the defect by advancement of a skin flap or other plastic procedure.

b. Adequate exposure of the *hip joint* is a specialized procedure that requires precise anatomical orientation. The same principles of management must be applied to improve the results after injury to this particular joint.

c. Wounds of the *ankle joint* with comminution of the os calcis or astragalus are peculiarly liable to sepsis. Initial débridement of comminuted bone fragments must be minimal if function is to be preserved. Efforts are made early in the reparative surgical phase to reduce or close the skin defect with split thickness graft when necessary. When sepsis is established, subperiosteal excision of necrotic bone fragments, followed by early wound closure by graft or suture, should not be delayed.

Urinary bladder injuries. a. Perforating wounds of the urinary bladder require repair. Drainage of the urine should be accomplished by suprapubic cystostomy, not by perineal urethrostomy. The space of Retzius should be drained always.

b. Certain technical details in the performance of suprapubic cystostomy are essential to successful subsequent management of the cystostomy. A number 34F Malecot or number 20F Pezzer type of tube *should be placed as high in the fundus of the bladder as possible* and brought out through the upper end of the wound. This placement is to avoid pressure necrosis and infection of the pubic bone and periosteum as well as trauma of the trigone by the proximal end of the tube. The suprapubic tube may be held in place by adhesive after the sutures have been removed.

Burns. Progress in the treatment of burns is reflected in the more liberal of whole blood transfusions during convalescence and the excision of third-degree eschars to facilitate earlier skin grafting.

a. Medical aid or emergency treatment of the burned area is accomplished by the application of a sterile pressure dressing. The burned area is covered with strips of sterile dry fine mesh or petrolatum gauze and a thick layer of sterile gauze. This is held in place by firm bandaging.

b. Initial surgical treatment is instituted as soon as possible.

(1) Resuscitation or prevention of circulatory failure is achieved by the adequate use of plasma. In extensive burns, quantities of plasma up to 12 units may be required in the first twenty-four hours.

(2) Pain is relieved by morphine in dosage of gr. ¼. Pain should be differentiated from the restlessness and apprehension of anoxia. Barbiturates may be an effective supplement to morphine.

(3) The dressing is changed in an operating room with full aseptic precautions. If the burned area appears clean, no further preparation of the wound is indicated. Small blisters should be left alone, but larger ones may be drained by simple puncture. Gentle washing and débridement are reserved for grossly soiled burns. General anesthesia should be avoided if possible. The burned area is covered with dry fine mesh or petrolatum gauze and a pressure dressing. On burns of the extremities the pressure dressing should include the entire extremity distal to the burn. Immobilization of the part by splinting is desirable when feasible.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(4) Systemic penicillin therapy is instituted in preference to sulfonamide therapy.

(5) The prevention of anemia demands liberal use of whole blood transfusions as soon as the initial hemoconcentration is corrected. Protein depletion is offset more effectively by increased dietary intake and whole blood transfusion than by continued dependence on plasma.

c. Reparative surgical management seeks to prevent contractures and excessive scarring by proper splinting and early skin grafting.

(1) Unless complications develop, the initial dressing is not disturbed for ten to fourteen days.

(2) The excision of devitalized tissue may be begun at this time. If this is associated with minimal blood loss, the area may be grafted immediately. More usually the wounds will be dressed again with fine mesh gauze and pressure dressings in anticipation of skin grafting three to five days later. The adoption of staged procedures in the removal of devitalized tissue is especially recommended for patients with extensive burns.

(3) Systemic penicillin therapy should be continued until skin grafting is effected.

(4) The hematocrit (or hemoglobin) value should be maintained by repeated transfusion of whole blood until all grafting has been concluded.

Gas gangrene. The bacteriologic demonstration of clostridia in a war wound is a minor contribution to diagnosis and clinical management. *Evaluation of the patient and examination of the wound* are necessary to distinguish between anaerobic cellulitis and clostridial myositis (gas gangrene).

a. Diagnosis. Anaerobic wound infection should be suspected in battle casualties failing to respond to resuscitative measures. After initial surgery, the patient should be observed especially for pain in the wound, increasing pulse rate, and disordered sensorium, either apathy or euphoria. In any suspected case the wound should be examined in an operating room with adequate light and instruments to permit thorough inspection and surgical treatment.

(1) *Anaerobic cellulitis* is characterized by the septic decomposition of tissues devitalized by trauma. Gas and pus may infiltrate fascial planes. The pus may produce necrosis of the surface of tissue exposed in the wound but there is no extensive invasion of living muscle. The patient may show signs of nonspecific toxemia in association with wound putrefaction.

(2) *Clostridial myositis* is characterized by the invasion and necrosis of living muscle tissue adjacent to the wound. The infection may be wet (edematous) or dry (emphysematous). The affected muscle is avascular, noncontractile, and presents a variety of color changes. These findings are usually present in addition to those described for anaerobic cellulitis. The toxemia is more profound.

b. Predisposing factors are listed in relative order of importance:

(1) Delayed or inadequate initial surgical treatment of the wound.

(2) Interruption of arterial blood supply to a limb by trauma, thrombosis, ligation, or spasm.

(3) Constrictive bandages, especially unsplit plaster casts.

(4) Persistent circulatory failure and severe anemia.

(5) Certain muscles derive their blood supply from one or two main sources. This is especially true for the gluteus maximus, hamstrings, rectus femoris, vastus intermedius, and gastrocnemius. Special care should be exercised in the surgical management of wounds of these muscles in order to preserve the blood supply.

c. Prophylaxis. The early application of sound principles of initial surgery is the most important factor in prophylaxis. Blood transfusion and penicillin therapy in selected cases supplement this program. The *wound*

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

should be left open at the time of initial surgery. Prophylactic gas gangrene antitoxin is not recommended.

d. Treatment. Anaerobic cellulitis responds to the secondary excision of devitalized tissue and the free incision of fascial planes. The same surgical procedure frequently will suffice to treat the infection and prepare the wound for later secondary closure. Clostridial myositis demands a more vigorous therapeutic program:

(1) *Surgery.* The most important factor in treatment is the prompt excision of all affected tissue. Local excision of a single muscle or group of muscles should be practiced in the interest of conservation of functional extremities. Amputation is advised for more extensive infection or where removal of the involved tissue implies loss of function of the limb.

(2) *Resuscitation.* The surgical excision of affected tissue contributes to resuscitation. Peripheral circulatory failure is frequently present, and whole blood transfusion is indicated. A severe anemia is usually present but hemoconcentration may occur in "wet" infections. Plasma is reserved for the correction of persistent hemoconcentration in selected cases. The demand for whole blood is considerable in the average case.

(3) *Chemotherapy.* Systemic penicillin therapy should be maintained in dosage of 200,000 to 400,000 units per day. (See "Chemotherapy" below.)

(4) Thrombophlebitis is an established hazard of anaerobic infection. Pulmonary embolism contributes to the mortality rate in gas gangrene. Aspiration, of thrombi and vein ligation should be practiced at the time of amputation or during convalescence on indication.

(5) *Naso-gastric intubation* with suction is necessary to combat abdominal distention and gastric dilatation.

(6) *Anuria* occurs with sufficient frequency to warrant especial consideration of fluid balance and urine volume. The exact mechanism of the anuria is not known. The vulnerability of the kidney to tissue anoxia secondary to protracted circulatory failure should not be forgotten.

(7) *Gas gangrene antitoxin* is of doubtful therapeutic value. It is clinically impossible to distinguish the specific toxemia due to clostridial exotoxins from the nonspecific toxemia due to products arising from the septic decomposition of devitalized tissue. Current enthusiasm for therapeutic antiserum is restricted largely to the use of the trivalent serum containing antibody to the *Cl. oedematiens* toxin in the treatment of "wet" types of infection.

(8) *Retroperitoneal cellulitis* and abscess may demand drainage early in the convalescence from gas gangrene.

Chemotherapy. No presently available chemotherapeutic agent can sterilize a contaminated or infected war wound. Neither penicillin nor the sulfonamides can prevent the ultimate septic decomposition of dead tissue or contaminated blood clots. Sulfonamides administered systemically are effective in the prevention and control of invasive hemolytic streptococcal infection but are ineffective in the control of staphylococcal or invasive clostridial infections. Penicillin is effective against hemolytic streptococci and staphylococci and, in addition, prevents the spread of clostridial infection from a focus of affected tissue. The effectiveness and limitations of chemotherapy are established sufficiently to attribute poor results to errors in surgical technique or judgment rather than to drug failures.

a. The concomitant use of sulfonamides and penicillin is unnecessary. The use of sulfonamides as a supplement to penicillin therapy contributes only the risk of untoward reactions and complications. There is no clinical evidence of synergism with the two agents.

b. The routine local use of chemotherapeutic agents has been abandoned. Penicillin may be instilled into serous cavities or major joints to

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

complement the initial or subsequent surgical management of injuries in these regions. Repeated dressings solely for the purpose of application of antibacterial agents contribute to persistent wound suppuration with aerobic wound pathogens.

c. Systemic chemotherapy is an adjuvant to the surgical management of a contaminated or infected wound. It does not offset the hazard of residual dead space or improper drainage.

TRENCH FOOT

Trench foot is the term applied to the condition resulting from prolonged exposure of the feet to cold and moisture, usually associated with dependency and immobility of the lower extremities and with constriction of the limbs by shoes or clothing. The condition is closely related to immersion foot and shelter foot. Prolonged standing or long hours spent in an upright or crouching position in cold, wet trenches or foxholes, especially if they have previously become mud-soaked by rain and the weather then changes to frost, and the continual wearing of wet socks and footgear, are the most frequently responsible circumstances leading to the development of the syndrome. The period of exposure varies from several hours to several weeks.

Factors influencing the occurrence and severity of the condition include degree of cold, duration of exposure, and footwear which, although affording some protection during short exposure, causes constriction and is harmful after long exposure. Contributory factors are dependency and immobility which reduce peripheral circulation; body cooling as from wind and inadequate, damp, or wet clothing and footwear, resulting in loss of body heat and production of general vasoconstriction with consequent circulatory stagnation; trauma; and dehydration and nutritional and vitamin deficiency. Men over 40 and youths under 17 appear to be less resistant to the general effects of cold than those of intermediate ages. Racial hypersusceptibility to cold has not been definitely established, but it appears that individuals accustomed to a warm environment do not have the same defenses as those who have been accustomed to colder climates.

Pathogenesis and morbid anatomy. The essential vascular change during the period of exposure and hypothermia is peripheral vasoconstriction which involves predominantly the arteriolar vessels but may affect even the larger arteries and which results in a decreased blood flow to the part. This is induced both reflexly and as a result of the direct action of cold. The resultant ischemia causes anoxia of the capillaries with consequent increased permeability, exudation, and edema. Existing arterial disease or compression of the part by tight shoes or leggings may accentuate this mechanism. Direct thermal injury to the skin and subcutaneous tissue from prolonged exposure to cold may also be a factor as well as the traumata incurred from walking on the damaged feet.

Immediately after the part is exposed to warmth, there occurs an intense inflammatory hyperemia with excessive vasodilatation which may be due to several factors, including the release of histamine-like substances resulting from tissue injury by the cold, actual damage to vessels, and nerve injury causing vasomotor paralysis. This phase of hyperemia is accompanied by swelling of the tissues and edema. The transudation of fluid may be due either to mechanical factors or, in most instances, to increased permeability of the damaged capillary endothelium. A vicious circle is thus established, in which transudation contributes further to an already exist-

---

From TM MED 81, 4 Aug. 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ing oxygen deficiency in the involved part. Involvement of peripheral nerves is suggested by paresthesias, dysthesias, anesthesia, and sudomotor disturbances. Meager histologic studies have revealed mixed degenerative and regenerative changes in peripheral nerves. The significance of these findings is not established, but local interference with neurogenic control of peripheral blood vessels is probable. The tissues appear edematous and contain perivascular collections of lymphocytes, extravasated blood cells, and some polymorphonuclear leukocytes rather similar to any sterile inflammatory reaction. The exudates are fibrinous and the finer lymphatics may be blocked. The vessels themselves may show intimal thickening and vacuolization of the muscle fibers or more complete disorganization with extending thrombosis in the vessels adjacent to the traumatized area. In the more severe forms, histologic studies made during the late stages of the condition, i. e., several months after exposure, show atrophy and thinning of the epidermis with much fibrosis and deposition of collagen around the nerve endings and blood vessels in the subcutaneous tissues. Fibrous infiltration of the muscles is also evident. This is believed to be the explanation for the late pain, rigidity, and weakness of the feet in this group of patients. The observation that these patients tend to improve spontaneously after six to eight months, the time at which collagen ceases to contract, supports this belief.

Clinical manifestations. a. Classification. The clinical manifestations vary. Depending on the period of exposure and extent of tissue damage, the condition as it appears clinically during the period following admission may be classified according to degree as mild, moderate, and severe. The mild type is characterized by erythema, slight sensory changes, and little or no pitting edema. In addition to these manifestations, there are, in the moderate type, blebs, ecchymotic spots, and definite pitting edema. In the severe forms, these manifestations are more pronounced with evidence of massive extravasations of blood and incipient or actual gangrene.

b. Signs and symptoms. (1) During onset and period of exposure, there is first an uncomfortable sensation of coldness of the feet, and this is soon followed by numbness. There may be temporary tingling, and mild aching or cramping pain about the arches, ankles, and soles of the feet. In general, discomfort is not pronounced during this period, and the most prominent manifestations are numbness and a heavy wooden sensation of the feet. The patients complain of ataxia, walking is clumsy, and they feel as if they were "walking on blocks of wood." Swelling of the feet may occur after several hours or days but is usually not pronounced at this time. The skin, which is at first red, later becomes pale, "waxy white," "sickly yellow," mottled blue, or purplish. Blisters usually develop at a later stage.

(2) At the time of admission and after the shoes are removed, the signs and symptoms enumerated above are present and may be more pronounced. The feet are cold and may be anesthetic to pain, touch, and temperature. The peripheral pulses may be absent. The signs and symptoms during this period are considerably influenced from the standpoint of onset, duration, and degree by the method of treatment, as well as by the degree of damage which resulted before treatment was instituted. However, the condition progresses through three more or less distinct stages, each with characteristic signs and symptoms:

(a) *Prehyperemic or ischemic stage.* This may last for several hours or more. The feet remain cold, somewhat swollen, discolored, and numb. Areas of purplish discoloration may sometimes be observed particularly in or about the toes. Although in the milder cases there may be hyperesthesia, most cases are characterized by anesthesia of varying extent. In the more

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

severe case, there is fairly extensive "sock anesthesia," and in the less severe forms these areas involve the toes and extent around the margins of the foot and over its plantar aspect. In some cases in which exposure has been sufficiently prolonged, areas of incipient or actual gangrene may be already apparent, particularly about the toes. Some patients have a poorly localized, dull, aching sensation in the feet. The peripheral pulses may remain absent for some hours. As the feet grow warm, swelling increases rapidly, and a severe burning pain begins, marking the onset of the second stage.

(*b*) *Hyperemic or inflammatory stage.* This may last from a few days to a few weeks. Swelling increases rapidly, and the feet become red, hyperemic, hot, and dry. The peripheral pulses are full and bounding. Damage is greatest in the toes, the distal part of the dorsum of the foot, and the ball of the foot. These parts remain edematous and hot and assume a livid cadaveric appearance. Blebs appear, except in the very mild cases, and may be filled with straw-colored fluid or extravasated blood. Patchy areas of ecchymosis are commonly found over the medial aspect of the first metatarsophalangeal joint, and of the longitudinal metatarsal arch, and over the sides of the foot. The rigid swelling, the redness, and the local warmth of the part indicate an intensive hyperemia. Superimposed damage to the peripheral vessels is suggested by the ulceration and actual gangrene which sometimes involves the more vulnerable parts, particularly the toes. The sensory disturbances are quite characteristic and may begin at once or be delayed for several days to a week. The initial anesthesia and hypesthesia are replaced by intense paresthesia. This has been described as an intense burning pain over the surface of the entire foot which seems to be relieved by cold and aggravated by heat or even by warmth. It is sometimes followed by intense, intermittent, stabbing, shooting pains beginning in the ankle joint or in the midtarsus and radiating to the tips of the toes. A generalized tingling sensation is often felt in the skin but is overshadowed by the burning pain. The periphery of the foot is usually anesthetic and this merges more proximally into areas of hyperesthesia and paresthesia. As these sensations subside, they gradually recede distally to the toes. The affected parts may ache or throb, and the pains are made worse by warmth and dependency. Anhydrosis or lack of sweating is evident and seems to coincide with sensory loss. The degree of edema varies with the extent of injury and, in the severe cases, may extend as high as the knee. Usually reaching its height by the fourth to sixth day, it gradually subsides to be followed by fine wrinkling of the skin. The red color slowly fades and usually within a week to ten days may take on a waxy pallor. In the majority of cases in which the injury has not been great, the skin assumes a normal color after some exfoliation. In a few cases, however, the feet become cold, blue, and sweaty. The subsidence of edema, heat, and redness marks the end of this stage.

Complications include localized infection, cellulitis, lymphangitis, and septicemia. Phlebothrombosis along the course of the veins of the dorsum of the feet and along the course of the saphenous veins has occurred and may be associated with petechiae in the nearby skin. Rarely transient hematuria and albuminuria, enlargement of the liver, and mild febrile reaction have been observed in cases of immersion foot and trench foot.

(*c*) *Posthyperemic stage.* The clinical manifestations during this stage vary and depend upon the degree of involvement and type of therapy. In the milder cases, the end results are satisfactory, and there is apparently complete recovery. In the more severe cases, there may be recurrence of pain, tingling, and swelling especially on walking, prolonged standing, or expo-

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

sure to cold. In many of these cases, the transition from the second to the third stage is not sharp but occurs gradually and, during this period, the manifestations may vary from hour to hour or from day to day from those characteristic of the third stage to those characteristic of the second. In a few cases, deep-seated aching pain persists and may be associated with tenderness in the joints, usually the first metatarsophalangeal joint, or may be localized deep in the arch of the foot. This is usually worse at night. In still others, there may be limitation of motion in the joints, muscle weakness and wasting, and difficulty in walking. Some complain of hyperhidrosis of the feet, and anesthesia and paresthesia in the tips of the toes are not uncommon. The late pains, the paresthesias, and rigidity of the part may be due to compression of nerve endings and infiltration of muscle bundles with scar tissue. Hypocalcification or evidence of osteoporosis has been demonstrated in some of the cases and appears on the roentgenogram as diffuse or rounded areas affecting the distal part of the metatarsal bones and the proximal part of the phalanges. Occasionally, the extremities may become excessively sensitive to cold so that Raynaud's phenomenon or simple coldness may persist for hours after return to a warm environment. These sequelae have been observed for months or years after exposure.

Prophylaxis. Prophylactic measures are directed toward conserving body heat and avoiding unnecessarily prolonged exposure of the feet to moisture, coldness, and other factors that decrease peripheral circulation.

a. Loose-fitting waterproof or water-resistant boots with replaceable thick felt innersoles and heavy woolen socks should be worn to provide good insulation as well as ventilation. The shoe pac (rubber foot-piece, leather top type of footgear) is probably best for this purpose except on rough, mountainous terrain. It is important, however, that the shoe pac fits properly and does not constrict the toes or foot when the innersole and heavy woolen socks are used. If shoes are worn, they should be water-resistant, of relatively soft top construction, and sufficiently large to accommodate heavy woolen socks without constriction.

b. Every effort should be made to keep the feet dry and if the socks or innersoles become damp or moist as a result of perspiration or prolonged immersion in wet mud or snow they should be replaced by dry ones as soon as possible. An extra pair of dry heavy woolen socks should be carried by each soldier and others made available by an exchange service when troops are on duty in wet, cold regions for periods longer than several days.

c. Standing in water or mud-soaked areas should be avoided as much as possible even though waterproof boots are worn. If the trench or foxhole contains water, it should be bailed out, if possible, and stones or branches of a tree placed at the bottom on which to stand.

d. The shoes should be removed at least once daily and the feet cleansed and dried. Innersoles and socks should be well dried before being replaced.

e. Cramped positions, prolonged immobility, and dependency of the extremities should be avoided. Frequent exercises and temporary elevation of the feet are desirable. If this is impracticable, exercise of the toes and ankles within the shoes and elevation of the feet should be done as frequently as possible.

f. The upper part of the body should be kept warm and dry, and exposure to cold winds reduced to a minimum. Gloves should be worn, if possible.

g. Constriction by tight clothing, shoes, socks, garters, and leggings should be avoided.

h. Nutrition should be maintained at as high a level as circumstances permit. Whiskey and other alcoholic beverages should be avoided.

i. Whenever feasible, the feet should be inspected at least once weekly and injuries or infections properly treated.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

j. Whenever circumstances permit, in cold, wet weather, troops should be relieved from front-line action after several days' exposure.

k. Unit commanders should be cognizant of the factors concerned in the causation and prevention of trench foot and of the importance of foot discipline and, in accordance with section IV, War Department Circular No. 312, 1944, are held responsible for the diligent application of the protective measures.

Treatment. The principles of treatment consist essentially of rest, avoidance of local trauma and infection, elevation of the feet to promote drainage of edema fluid, and reduction of metabolism in the affected part. The rationale of treatment is to reduce the metabolic demands of the part until edema subsides, extravasated blood is absorbed, and vasomotor tone is re-established. Under these conditions, rapid tissue repair is favored. During the recovery stage, the reactive hyperemia, if too intense and if induced too rapidly, can be not only painful but also harmful. Therefore, rapid warming should be avoided.

a. Initial or emergency treatment. (1) As soon as the symptoms of trench foot appear, the patient should be sent to the hospital. He should be carried and not permitted to walk on damaged feet.

(2) Wet clothing should be removed and the patient wrapped in warm blankets, leaving the involved extremities exposed to the air in a moderately cool room.

(3) The involved extremities should be handled very gently. The limbs should not be rubbed or massaged. If necessary, the feet may be cleansed carefully with plain white soap and water, dried, and then allowed to remain exposed, and elevated on pillows. While it is desirable to warm the patient, the feet should always be kept cool by exposure to the room air.

(4) Strict asepsis must be maintained to avoid infection which may readily develop and rapidly spread in the damaged tissue of the feet. If sulfonamide drugs are available, they may be administered orally until the danger of spreading infection is past.

(5) Protection against pressure necrosis especially in the region of the heel is desirable and may be accomplished by frequent turning, by doughnut dressings, or by supporting the back of the legs down to the ankles on a pillow.

(6) During evacuation to the hospital, loose covering of the feet with sterile or, at least, clean towels or sheet is desirable in order to protect against bacterial contamination.

b. Definitive treatment. The same principles which underlie the initial treatment measures (that is, conservation of body heat and avoidance of trauma, infection, and heat to the involved part) are continued in the definitive treatment.

(1) Patients should be kept in bed, with the affected parts on a horizontal level with or elevated on pillows only slightly above heart level, and protected from external pressure either by complete exposure or by means of a cradle. Elevation of the extremities should be done only if there is no evidence of inadequate circulation, that is, incipient gangrene; otherwise they should be maintained on a horizontal level. The period of bed rest is determined by the degree and rate of subsidence of edema.

(2) Massage or rubbing of any sort in the early stages must be avoided, and the part should be handled as little and as gently as possible. All antiseptics and ointments should be avoided, and blisters ordinarily should not be disturbed.

(3) Although the feet should remain exposed to the moderately cool room air (65° F. to 70° F.), the body should be kept warm by means of blankets.

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

(4) In the early prehyperemic or ischemic stage when vasospasm is still evident and persists for longer than six hours, whiskey in 1-ounce doses may be administered for its vasodilating effect. Sympathetic block, using 1 percent procaine hydrochloride solution, may also be done for this purpose. These measures are not indicated after the hyperemic stage begins and should be discontinued.

(5) Maintenance of minimal tissue metabolism in the affected parts is important especially during the hyperemic stage and may be accomplished by strictly avoiding the application of external heat, and if necessary, by actually cooling the limbs, in those cases in which persistent pain indicates the need for such treatment. In instances where the room temperature is not above 70° F., simple exposure of the parts may be sufficient. Cooling may be enhanced by directing the air from an electric fan against the exposed feet. Still greater cooling can be accomplished by spraying cold water from an atomizer through the fan blades. In the more severe cases with intense hyperemia and severe neuritic pains, these measures may be inadequate and greater cooling is required. This may be achieved through the application of ice bags or the use of a special refrigeration cabinet. If ice bags are to be used, sterile pledgets of cotton or gauze are placed between the toes and the whole foot loosely wrapped with sterile cotton batting and covered with a sterile sheet or towel. Carefully dried ice bags are then placed around each foot over the towel and the whole inclosed in an oiled-silk bag, around which, in turn, are wrapped thick layers of cellucotton or other equivalent insulating material. As an outer covering, a rubber pillowcase may be used, loosely tied about the upper calf. Ordinarily, it is sufficient to change the ice bags about every four hours. At this time, palpation of the toes may be done to make sure that the part is not too severely chilled. Ordinarily, a skin temperature of about 70° F. is optimum whether ice bags or a refrigeration cabinet is used. In cases with extreme hyperemia, more frequent changing will be necessary, but as hyperemia subsides, fewer ice bags will be needed to reduce the temperature of the foot to the required degree. It may be necessary to continue the ice-bag treatment for several days to two weeks. Care should be exercised to avoid wetting and maceration of the skin by the ice bags.

(6) Measures to prevent secondary infection including tetanus should always be instituted. Sulfadiazine by mouth should be used in cases with threatening infection. Blisters ordinarily should not be disturbed but, if opening becomes necessary, this should be done aseptically, using a needle. Dressings, except when cooling is done by ice bags, and all local medication should be avoided. Areas of necrosis and ulceration which may subsequently develop should be treated conservatively as long as possible. In patients with gangrene, amputation should be delayed as long as possible and done early only in the presence of superimposed infection.

(7) A generally nutritious high protein, high vitamin diet should be supplied.

(8) After the hyperemia and edema have subsided, graduated vascular exercises should be instituted. These consist of: elevating the extremities one to two minutes at an angle of 30 degrees to 50 degrees; hanging the extremities over the side of the bed for two to four minutes during which the patient should flex and extend the toes; and assuming the supine position with the feet in the horizontal position for two to four minutes. This cycle is to be repeated for periods of thirty minutes, three to four times daily, for at least a week before the patient is allowed out of bed. Gradually increasing activity should then be urged.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(9) Physiotherapy, including warm baths, massage, and passive exercises, is of value in the late stages and should be used, especially when the movement of the toes is limited by late fibrosis or edema.

(10) In cases with intractable edema and pain not controlled by ordinary measures, sympathetic block, using 1 percent procaine hydrochloride solution, compression dressings, or an elastic bandage, may be cautiously employed even though the value of these measures has not yet been established. Sympathectomy is indicated only in cases in which there is objective evidence of circulatory insufficiency or in which manifestations resembling Raynaud's phenomenon develop and persist months or years after the acute phase of the disease and can be shown to be relieved by "test" sympathetic blocks.

LOCAL ANESTHETIC AGENTS

Considerable variation exists in the relative toxicity and anesthetic efficiency of local anesthetic agents. In experienced hands and for specific purposes most of these drugs have been found useful. For practical purposes, however, and to minimize potential hazards, it is possible to limit the number of these drugs to those which provide a wide field of usefulness and combine the desirable properties of simplicity, safety, and anesthetic efficiency. In general, whenever there have been two agents or methods which can effect the same result and one is known to be safer than the other, the safer one has been endorsed and the other discontinued. For these reasons, only those drugs listed below will be used as local anesthetics in accordance with the type of anesthesia specified:

Spinal anesthesia

1380200	Procaine hydrochloride, U.S.P., 100-mg. ampules
1380600	Procaine hydrochloride, U.S.P., 150-mg. ampules
1354500	Pontocaine hydrochloride, N.N.R., 1%, 2-cc. ampules

Topical

1145000	Cocaine hydrochloride, U.S.P.

Nerve block and infiltration

1384000	Procaine hydrochloride and epinephrine hypo tablet: 1 tablet in 1 cc. makes 2% solution
1383500	Procaine hydrochloride, cartridge, 2%, 2.5 cc.
1383000	Procaine hydrochloride, N.F., 3-gr. hypo tablet
1382000	Procaine hydrochloride, N. F., ¾-gr. hypo tablet
1381000	Procaine hydrochloride, U.S.P.

Intelligent use of these drugs based on a knowledge of their pharmacologic properties will minimize the occurrence of untoward reactions. Certain principles which govern the clinical application of these drugs should be followed. Preliminary sedation is desirable, and the barbiturates are the preparations of choice, since there is some evidence to indicate that they lessen the toxicity of local anesthetic agents. In the presence of trauma, inflammation, or stricture, anesthetic agents should not be injected into the urethra. One of the most frequent causes of accident following the use of procaine, and especially cocaine, is overdosage due to errors in the preparation of solutions from the bulk drug. In order to avoid this danger, great care should be exercised in the preparation of these solutions. Precautions should also be taken against the danger of confusing cocaine and procaine, either by the use of a dye or by conspicuous bottles. To avoid intravenous injections, aspiration with the plunger of the syringe should always be done before injecting the anesthetic solution into the tissues.

Since all local anesthetics are toxic, the smallest amount of anesthetic solution compatible with successful anesthesia should be used. Cocaine is to be used only for surface anesthesia and only in nose and throat work.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

The concentrations must never exceed 20 percent. For nerve block and infiltration anesthesia, procaine hydrochloride only will be used and the total dose should never exceed 1.0 gm. Solutions of 1 or 2 percent are recommended for nerve block and ¼ or ½ of 1 percent for infiltration. The number of local anesthetic agents has been limited to only a few of the simplest, safest, and most effective agents.

Prevention and treatment of toxic reactions. In severe poisoning by local anesthetic agent, convulsions are almost invariably present. This condition leads to anoxia and respiratory paralysis. Convulsion should be treated by the intravenous administration of barbiturates, preferably pentothal sodium or pentobarbital sodium (nembutal). The administration of oxygen should begin at once. It should be given by continuous flow if the patient is breathing. If respiration is irregular, shallow, or has stopped completely, artificial respiration should be given by lung inflation, using 100 percent oxygen. An anesthetic apparatus or a standard Army resuscitator may be used for this purpose. Anesthesia apparatus or resuscitative equipment should always be available where local or topical anesthetics are being used. If convulsions are not immediately controlled so that the lungs may be inflated, death is likely to follow within a very few minutes' time. Death due to topical or local anesthesia is not a rare occurrence. Acute toxic reactions are not uncommon, especially where cocaine is used. Most accidents are due to excessive dosage, faulty technique, improper identification of the drug, or, in rare instances, to increased susceptibility. Toxic symptoms for cocaine are similar to those for the synthetic substitutes. Fatal cases run a very rapid course, beginning usually with anxiety, sudden fainting, extreme pallor, dyspnea, convulsions, arrest of respiration, and death. A nonfatal toxic reaction is manifested by confusion, laughter, vertigo, motor excitement, quickened pulse, palpitation, and irregular respiration. Pallor, chills with profuse perspiration, rise in body temperature, dilated pupils, exopthalmos, nausea and vomiting, and abdominal pain are not uncommon. These symptoms may be followed by Cheyne-Stokes respiration, marked muscular tremor, and they may progress to convulsions resulting in anoxic death. The treatment of poisoning should begin with prevention. Local anesthetic drugs should be carefully selected, and a great deal of care must be exercised to prevent overdosage. Large quantities of cocaine solution are not necessary to produce surface anesthesia. Placing large, dripping-wet sponges carrying cocaine solution into the patient's nose or throat can be dangerous. If this careless technique is used, large quantities of the solution will run down to the patient's pharynx and will be swallowed. One or 2 cc. of the cocaine solution, absorbed through gastric or intestinal mucosa, may prove fatal. One cc. of 5 percent solution of cocaine contains 50 mg. (almost 1 grain of the drug). One cc. of 10 percent solution contains 100 mg. (almost 2 grains of the drug). One cc. of 20 percent solution contains 200 mg. (almost 3½ grains of the drug). Sponges or applicators carrying cocaine to the nose or throat should have excessive solution removed by compression before the drug is brought into contact with the mucous membranes. This technique will tend to prevent toxic reactions from overdosage.

DID YOU RECEIVE YOUR BULLETIN?

If during the period of redeployment, any Medical, Dental, Veterinary, or Sanitary Corps officer fails to receive *The Bulletin*, he may write to The Surgeon General's Office, Washington 25, D. C., and an effort will be made to forward *The Bulletin* to him.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Vol. IV
No. 3

MEDICINE

SCHISTOSOMIASIS JAPONICA

Three species of blood flukes are important agents in human disease—*Schistosoma haematobium*, *S. mansoni*, and *S. japonicum*. This bulletin is devoted to infection with *S. japonicum*. This disease is limited to foci in Japan, Formosa, China, the Philippines, and the Celebes.

Hugh J. Morgan, Brigadier General, U. S. Army, director, Medical Consultants Division, The Surgeon General's Office.

Etiological agent. Unlike other nematodes, the adult worms of *Schistosoma* have separate sexes. The female worm deposits eggs in the small venules of the intestinal wall. Some of these eggs are extruded and are discharged in the feces. The eggs hatch within a few hours in fresh water, liberating a ciliated free-swimming larva or miracidium. The miracidium invades the soft tissues of a suitable snail, its intermediate host, where it undergoes development and asexual multiplication resulting in the production of numerous free-swimming, fork-tailed cercariae, the infective stage for man. If cercariae are successful in contacting the skin or mucous membrane of man or appropriate animals, they rapidly penetrate the tissue and enter the venous circulation, making their way to the intrahepatic portions of the portal vein, where they mature and pair. They then proceed to small branches of the mesenteric veins where they settle down. Mature worms are sexually paired in the mesenteric venules, where egg deposition occurs. Eggs are extruded into the lumen of the gut and appear in the feces after four to six weeks. Others are carried to the liver, mesenteric nodes, and to a lesser degree other abdominal organs. In unusual cases eggs may be found in the lungs, heart, brain, or other parts of the body. The presence of eggs in the tissues gives rise to small abscess-like formations.

Transmission. Only certain species of snails are suitable for the larval development of *Schistosoma japonicum*. Sources of infection are limited to regions where these species are present. These snails are small in size and are most abundant in still water. Infection is generally acquired by coming in contact with water infested with cercariae. Spread of schistosomiasis is favored by poor sanitation which allows contamination of water with feces containing eggs.

Course. Early symptoms are often transient and may be overlooked. A papular rash or itching may appear immediately after exposure. However, the first symptoms usually are noted between three and ten weeks after infection. They include fever, chills, sweats, itching, unproductive cough,

Abstract of TB MED 167, June 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

headache, stiffness of neck muscles, chest pain, epigastric pain, general abdominal discomfort or crampy pain, and pain in the back or legs. Anorexia and weight loss are often striking. Diarrhea is usually not severe at this stage. In some instances, signs of involvement of the central nervous system appear. Urticaria, edema, signs suggestive of bronchopneumonia, and abdominal tenderness may be present. Lymph node enlargement may be demonstrable. The liver and, at a somewhat later stage, the spleen are often palpable. X-ray pictures of the lungs may show scattered areas of infiltration. In the early stages, the blood characteristically shows a rapidly increasing white cell count, with marked eosinophilia. At first there is no anemia. After deposition of eggs has begun, the stools may contain blood and mucus, as well as eggs. These symptoms may last from two to ten weeks. There may be relapses and remissions, but spontaneous cessation of early symptoms ultimately occurs in most cases, if reinfection does not occur. As time goes on, affected tissues react to the increasing numbers of eggs deposited in them by extensive proliferation and repair. The results which may develop after a number of years include: thickening of the intestinal wall and formation of papillomata; thrombosis of mesenteric, portal, or splenic veins; cirrhosis of the liver, splenomegaly, and ascites. Emaciation may be extreme. Dysentery may appear from time to time. At this stage, frequently, if not usually, the stools do not contain schistosome eggs. Anemia may be severe. Eosinophilia is rarely present.

Diagnosis. In the early stage, a history of exposure is a most important clue to the diagnosis, particularly in a group of individuals with the same exposure and a similar clinical course. The clinical findings of outstanding significance are urticaria, itching, fever, cough, diarrhea, palpable liver, and (somewhat later) palpable spleen. The diagnosis should be confirmed by the demonstration of ova in the stools. Proctoscopy, performed by trained personnel, may aid in diagnosis. *Laboratory.* Specific diagnosis is established by the demonstration of the typical eggs in the stool specimen. Among the techniques available are direct examination of a fecal smear, sedimentation, egg hatching, and the acid-ether concentration method. These procedures are described in detail in the original TB MED. In the early stages, leukocytosis is often present, with total counts ranging from 12,000 to 20,000 and sometimes to 60,000 or more. Eosinophilia is common. The presence or absence of other intestinal parasites should be determined.

Treatment. In early schistosomiasis, if significant constitutional symptoms or diarrhea are present, the patient should be confined to bed. The diet should afford a liberal supply of all the essential nutrients. Supplementation with four multivitamin tablets a day is recommended. If diarrhea is present, the diet should be bland or soft. At present, it is recommended that patients with schistosomiasis be treated with fuadin or with antimony and potassium tartrate. The early institution of chemotherapy for schistosomiasis is imperative, unless the presence of another serious disease contraindicates it. Antimony compounds should always be given with care, especially with close observation of the patient's reactions to their administration. It should be remembered that small dosages are often followed by therapeutic failure. Among the toxic effects which have been reported are depression of the circulation and respiration, and irritation of the central nervous system, liver, and kidneys. Sudden death during injection has been reported. In general, antimony compounds are contraindicated in the presence of disease of the heart, liver, or kidneys. As a rule, they should not be administered concurrently with other metals or potential cardiac depressants, such as emetine. *Fuadin.* This drug is also known as neoantimosan and stibophen. It is supplied in ampules containing 6.4 percent solution (about 0.064 gm. fuadin in 1 cc.). Fuadin solution is given intramuscularly and should be injected slowly. The first three doses

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

of 1.5 cc., 3.5 cc., and 5.0 cc. are given on successive days. On the fifth and subsequent alternate days, 5 cc. are given, provided no toxic effect other than nausea appears, until a total of sixteen doses has been administered (75 cc. of solution, containing 0.653 gm. of antimony). The only commonly reported toxic symptoms are nausea and vomiting. Rarely, joint and muscle pains may appear. If toxic symptoms occur, the subsequent dose should be reduced or the administration temporarily or permanently discontinued, according to the circumstances. The course of treatment may be repeated after two weeks' rest. However, if a course of fuadin is ineffectual, it is recommended that the patient receive antimony and potassium tartrate.

Antimony and potassium tartrate (tartar emetic). It is recommended that this compound be administered in a concentration of 0.5 percent. Solutions should be freshly prepared with strict aseptic precautions, using a sterile spatula and weighing vessel in physiologic saline, 5 percent glucose, or distilled water. If doubt exists regarding the suitability of available supplies or technique, antimony and potassium tartrate solutions should be sterilized by gentle boiling for five minutes. They should not be autoclaved. Antimony and potassium tartrate is best tolerated two or three hours after a light meal. It should be administered intravenously and should be given slowly. The needle should be wiped with a sterile sponge, and care should be taken to avoid extravasation. The patient should remain recumbent for at least an hour after treatment. The first dose of the 0.5 percent solution is 8 cc. (0.04 gm. tartrate). Provided no untoward reaction occurs, subsequent doses are given on alternate days and are increased on each occasion by 4 cc. (0.02 gm. tartrate), until 28 cc. (0.14 gm. tartrate) are being given. If no toxic reaction appears, a total of fifteen doses is given (360 cc. of solution, containing 0.648 gm. antimony). The toxic effects of antimony and potassium tartrate include coughing immediately upon injection, which is not important; nausea; vomiting; stiffness of joints and muscles; sense of constriction of the chest; pain in the upper abdomen; bradycardia; dizziness; and collapse. Transient electrocardiographic changes without corresponding clinical manifestations have been reported. If a toxic reaction other than coughing occurs during administration, the injection should be stopped at once. Following any toxic effect, the subsequent dose should be reduced or the administration of the drug temporarily or permanently discontinued, according to the circumstances. The course of treatment should not be repeated until after two weeks have elapsed without treatment. Patients should be followed carefully to determine whether further courses of treatment are necessary. If viable eggs are present four weeks or more after a course of treatment is finished, treatment should be reinstituted after a suitable interval. Stool examinations should be done at least every week during treatment, at the end of a course of treatment, and at intervals thereafter for at least three months, but individuals should not be retained in the status of patients for this purpose alone. Individuals who have had schistosomiasis should be re-examined from time to time for a year following treatment.

Prevention. Prevention of schistosomiasis in military forces depends primarily on avoidance of contact with fresh water infested with cercariae. Swimming, bathing, and laundering of clothes and the washing of vehicles in fresh-water ponds, streams, and canals should be prohibited in endemic areas. Educational lectures and propaganda posters should be utilized to indoctrinate troops in the necessity for avoiding contact with infested water. When practicable, rubber hip boots, waders, rubber gloves, or other waterproofed clothing should be worn by personnel whose duties require that they work in unsafe water. In case of accidental or necessary entrance into water suspected of containing cercariae, immediate bathing with soap and brisk rubbing of the skin with a towel may reduce the chance of infec-

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

tion. Only water treated so that cercariae are killed should be used for bathing, laundry, vehicle washing, and drinking purposes. Usual methods of filtration and chlorination cannot be relied on to remove or destroy cercariae. The newly standardized diatomaceous earth filter, however, is effective. Application of chlorine sufficient to provide one part per million residual at the end of thirty minutes' contact is sufficient to kill cercariae. When using canteens, treatment with two halazone tablets for clear water and four tablets for turbid or colored water is adequate to kill cercariae after thirty minutes' contact. Copper sulfate or copper carbonate (3 pounds per 1,000 square feet of water surface to be treated) may be used to kill the snail intermediate hosts. These measures have their greatest usefulness where the infested bodies of water are small. Prevention of pollution of water by proper disposal of human feces from infected individuals is a control measure which reduces the number of infected snails. However, domestic animals, such as dogs, cats, cattle, and water buffalo, often harbor *S. japonicum* and may serve to spread the infection.

THE MANAGEMENT OF THE DYSENTERIES

When outbreaks of dysentery or acute diarrhea occur, medical officers should formulate a plan for the management of these cases as a group. Definite arrangements should be made for the concentration of patients in one or more wards. Preliminary sanitary and therapeutic steps should not be delayed until the etiological diagnosis in all its details is fully established. Stools for study should be fresh. In all cases, the ward officer should see for himself freshly passed stools (not specimens). The best diagnostic results are obtained when microscopic examinations and culture inoculations are done on the ward. If this cannot be done, it is the responsibility of the ward officer himself to make sure that cultures and specimens reach the laboratory promptly. When the number of dysentery patients is large, unnecessary laboratory procedures for the whole hospital should be reduced in number. In the management of large numbers of patients, it is essential to follow faithfully a few basic plans of therapy. The results of treatment of dysentery should be carefully checked before the patient is released. Careful attention should be paid to isolation procedures until patients are free from infection. The public health responsibility in the dysenteries is as serious as in any other instance.

BACILLARY DYSENTERY*

Bacillary dysentery is due to infection with various dysentery bacilli of the genus *Shigella*. The disease is transmitted by the ingestion of food or drink contaminated with the feces of patients or of carriers of the bacilli. The incubation period varies from twenty-four hours to a few days. In most groups of patients, mild cases are numerous. In more severe cases, the onset is sudden, with fever, abdominal cramps, urgent bowel movements, and loose or watery, yellow or green stools which may change to characteristic mucopurulent, bloody stools. Prostration and dehydration may be marked in neglected cases. The mildest cases may recover in a few days with bed rest alone or without treatment, but chemotherapy should not be withheld because of this fact. Neglected cases which become chronic are difficult to treat, are a danger to those about them, and may end fatally.

Diagnosis. The disease should be suspected from the clinical course. The specific diagnosis of bacillary dysentery depends upon identification of

*Abstract of TB MED 119, Nov. 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

the bacilli in cultures of stools or rectal swabs. When facilities are available, stool specimens should be cultured at two-day intervals. Material for culture must be inoculated on suitable media without delay. The use of rectal swabs is highly recommended. A rapid, convenient technique for securing specimens by rectal swab is outlined in detail in TB MED 119. Inhibitory media that prevent the growth of *Escherichia coli* greatly simplify the culture of the dysentery organisms. S S agar and desoxycholate-citrate medium are most useful for this purpose. If feasible, the culture plate should be inoculated at the bedside of the patient by rubbing the swab over it immediately upon removal from the body. After twenty-four hours of incubation, dysentery bacilli form colorless colonies up to 1 mm. in diameter, sometimes larger, on the S S agar. Transfers should be made from suspicious colonies to differential media, such as Russel's double sugar agar or Kligler's iron agar. After twenty-four hours of incubation, the presence of an acid butt with no gas and an alkaline slant indicates the presence of a *Shigella* organism, provided that it is nonmotile. Further biochemical and serologic tests should then be made to identify the type (see TM 8-227).

Treatment. In all mild and moderately severe cases without hydration or prostration, the fluid intake should be 3,000 cc. or more every twenty-four hours. In fulminant cases or when for any reason there are clinical signs of dehydration, 1,000 cc. physiologic saline solution containing 5 percent glucose should be injected intravenously. This injection should be repeated as often as necessary to maintain a urinary output of 1,000 cc. or more per day. If the patient is in shock 500 cc. human plasma should be injected intravenously. Sulfonamide therapy should be instituted when, but not before, steps have been taken toward the maintenance, or restoration and maintenance, of normal hydration. With the dosage here recommended serious reactions are uncommon, except in hypersensitive individuals. Chemotherapy should be continued for a minimum of five days and should not be discontinued until two days after clinical recovery. If the infection is refactory, trial should be made of another sulfonamide. It should be borne in mind that the diagnosis may be erroneous. In the event of clinical relapse or recurrence of positive stool cultures after chemotherapy has been discontinued, treatment should be reinstituted. Sulfadiazine is the drug of choice for initial treatment; if sulfadiazine is not available, sulfathiazole may be used. The recommended dosage of either drug for use in this infection is 2.0 gm. initially, followed by 1.0 gm. four times a day. Sulfasuxidine has been recommended for use in cases refractory to sulfadiazine or sulfathiazole. The dosage is 5.0 gm. four times a day. Sulfaguanidine, though less effective than sulfadiazine, sulfathiazole, or sulfasuxidine, has given good results in many cases. The dosage is 5.0 gm. four times a day or 3.5 gm. every four hours, day and night. Penicillin is an ineffective treatment agent. Bed rest should be complete. The diet should be fluid, or soft, free from residue, and for forty-eight hours restricted in amount. Vitamin supplements, especially of the B complex, should be given. Purgation, high enemas, and colonic irrigations are contraindicated. Patients should be observed for at least two days following cessation of therapy. When facilities for stool cultures are available, two consecutive cultures should be negative before disposition.

Prevention. Patients should be isolated and their feces disposed of with proper sanitary precautions. Bedding, night clothing, and dishes should be disinfected by boiling. Water and fresh food supplies should be supervised at their source and protected from contamination until consumed. Eating establishments located outside of military reservations which fail to meet proper sanitary standards should be declared "out of bounds." In regions where human excreta are used for fertilizer, fresh vegetables should not be

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

served unless cooked. Care should be given to the proper storage and refrigeration of prepared foodstuffs; serving of leftover foods should be avoided. Dishes and kitchen utensils should be washed in warm, soapy water, rinsed in very hot water, and air-dried. Mess personnel should be instructed in personal hygiene, particularly the proper cleansing of hands. When facilities are available, routine examinations of food handlers should be made to detect carriers. In tropical countries natives should not be employed as food handlers. Sanitary disposal should be made of human excreta, garbage, and kitchen wastes. Prevalence of flies is frequently associated with the spread of bacillary dysentery, and control of these insects is essential. Latrines should be of flyproof construction. Kitchens and mess halls should be adequately screened and destruction of adult flies with insecticides, traps, and fly swatters should be practiced routinely. DDT residual spray should be applied at the rate of 200 mg. of DDT per square foot (1 quart per 250 square feet) to screens, walls, ceilings, light fixtures of kitchens and mess halls. Garbage racks also should be treated. Pit latrines should be treated by spraying the walls of the pit, the inside and outside of the latrine box, and the walls and screens of the inclosure. To control fly breeding in pit latrines, DDT residual spray should be applied evenly over the fecal contents at the rate of 2 ounces per latrine box hole, or 1 ounce of 10 percent DDT powder may be used. This treatment should be repeated twice a week.

AMEBIASIS

Etiology and transmission. The life cycle of ***Endamoeba histolytica***, a rhizopod protozoon, includes trophozoite, precystic, and cystic stages. Only the cystic stage persists free in nature. Natural infection occurs through the ingestion of cysts. When cysts reach the region of the ileocecal valve, excystation occurs, resulting in free trophozoites which may attack the tissues. Encystment does not take place in the tissues, but only in the lumen of the gut. Amebic infection is acquired by the ingestion of food or drink contaminated by feces containing amebic cysts. Contamination of food and drink by so-called carriers or infected individuals who at the time do not have diarrheal stools is the most important means of spread. Vegetables grown in soil fertilized by human feces may be a dangerous source of infection. Contamination of the water supply is a frequent source.

Course. The severity of amebic infection is extremely variable. Many individuals who are infected never have symptoms which can, with certainty, be attributed to the disease. Infections may persist for many years. ***Intestinal infection.*** Any part of the colon, and rarely the terminal portion of the ileum, may be affected. The earliest lesion is a small abscess, usually in the submucosa. Later, ulcers form which, as seen after death, tend to be ragged, undermined, and large. When symptoms develop, they may appear as soon as eight to eleven days after infection, but usually the interval is longer, sometimes many months. In the absence of treatment, the course is usually long drawn out, often with many remissions and relapses. The principal symptoms in mild cases are diarrhea (often without gross blood, pus, or mucus in the stools) and abdominal pain and tenderness. Fever and leukocytosis are absent. In severe cases, the classical picture of dysentery may appear suddenly, or it may grow gradually out of the mild condition just mentioned. The symptoms include headache, nausea, griping abdominal pain, abdominal tenderness, and fever. Increased frequency of bowel movements and tenesmus occur in varying degrees. In some cases, periods of constipation alternate with those of diarrhea. When chronic

---

Abstract of TB MED 159, May 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

infection is fully established, the intestine is profoundly altered, showing extensive ulceration and gross thickening. The process may give rise to extensive adhesions or to peritonitis which may be either localized or generalized. *Hepatitis and hepatic abscess.* Involvement of the liver arises from intestinal infection. Hepatic disease usually appears one to three months after an attack of dysentery, but it may manifest itself during an attack or much later. Diffuse amebic hepatitis may be an early stage of abscess formation. The symptoms of hepatic abscess include pain or discomfort over the liver, with occasional reference to the right shoulder, irregular and intermittent fever, sweats, chills, nausea, vomiting, weakness, and loss of weight. Jaundice, except in mild degree, is unusual. Diarrhea or dysentery is present in only about one-fourth of the cases of proved liver disease. Liver abscesses may rupture in any direction and into any neighboring organ. *Other lesions.* In rare instances, the lungs, brain, and other organs are infected by hematogenous spread from the intestines. Lesions of the skin are occasionally infected with amebae.

Diagnosis. The possibility of amebic infection should be brought to mind by the clinical picture and by epidemiological considerations. The final diagnosis should be based on the demonstration of the etiological agent. Amebic dysentery must be differentiated from other forms of protozoal dystentery, bacillary dysentery, cholera, mucous colitis, intestinal tuberculosis, lymphogranuloma venereum, and schistosomiasis. Bacillary rather than amebic dysentery should be suspected when there is sudden and fulminating onset with prostration and bloody stools. Proctoscopy following a saline enema is a valuable aid, since lesions are often readily visible. Amebic ulcers usually do not appear to be deep, ragged, or undermined, and may not suggest to the inexperienced observer the presence of serious disease. Material for examination should be obtained through the proctoscope from any lesion which may be in sight. The suction pipette method, as described in the TB MED, is particularly effective. Amebic infections of the liver must be separated from other forms of hepatitis, including abscesses due to bacterial infection. The diagnosis of diffuse amebic hepatitis can only be suspected on clinical grounds. When an abscess is present, the liver is usually enlarged and tender. Tenderness may be demonstrable by bimanual compression of the lower right chest wall. Signs of involvement of the diaphragm, pleura, or lung may be found. X-ray studies are exceedingly helpful. *Laboratory studies.* The blood may show leukocystosis. Eosinophilia does not occur. In contrast to the findings in bacillary dysentery, leukocytes are relatively scarce in the stools. Red blood cells are numerous and Charcot-Leyden crystals may be present. Motile forms of *Endamoeba histolytica* may be found in diarrheic and dysenteric stools, in exudates from lesions, and in abscess contents. Amebic infection should never be considered to be excluded as the result of a single examination. Search for motile amebae should only be made in freshly obtained material. It may be necessary to give a saline cathartic. Cysts of *Endamoeba histolytica* should be sought in formed and semiformed stools. When stools are formed, examination of freshly passed specimens is preferable. Since a single examination detects only about 50 percent of cyst carriers, at least three specimens obtained on different days should be examined. Concentration by zinc sulfate flotation is the most certain method for finding cysts. For a detailed description of methods and the morphology of forms of *E. histolytica*, see TM 8-227.

Treatment. Patients with symptomatic amebic infection should be kept in bed, unless the symptoms are very mild. *Acute or chronic amebic dysentery.* In acute cases, the diet should be liquid until symptoms subside and then soft with low residue. In chronic cases, the diet should be soft. The recommended antiamebic treatment includes three drugs. The administra-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

tion of carbarsone and either diodoquin or chiniofon in addition to emetine is considered essential. (1) Emetine hydrochloride is given subcutaneously or intramuscularly in doses for adults not to exceed 0.03 gm. (½ grain) twice a day, or 0.06 gm. (1 grain) once a day, during the period of diarrhea, but not for more than four to six days. Patients should be confined to bed while receiving emetine and for a few days thereafter. A course should not be repeated until two weeks have elapsed. Emetine should not be given to patients who have no symptoms or only very mild symptoms, or to patients with heart disease. The toxic effects include nausea, vomiting, muscular weakness, neuritis, myocarditis (manifested by increased pulse rate or decreased blood pressure), and prostration. If available, electrocardiograms are helpful in following the toxic action of the drug. If any toxic sign appears, the administration of the drug should be stopped at once. Concurrently with the administration of emetine, carbarsone is given. (2) Carbarsone is given by mouth in doses of 0.25 gm. (3¾ grains) three times a day for seven days. It should not be given to patients with hepatic disease. Toxic symptoms, which are rare, include abdominal distress, diarrhea, nausea, and vomiting; very rarely, exfoliative dermatitis, and possibly visual disturbances may occur. Carbarsone is followed by diodoquin or chiniofon. If for any reason carbarsone is omitted, diodoquin may be administered concurrently with emetine. (3) Diodoquin is given by mouth in doses of 0.63 gm. or 9.6 grains (3 tablets of 0.21 gm. or 3.2 grains each) three times a day for seven days. No significant toxic symptoms have been reported. (4) As an alternative to diodoquin, chiniofon may be given by mouth in doses of 1 gm. (15 grains) three times a day for seven days. The only toxic symptom commonly encountered is watery diarrhea. (5) In some refractory cases, especially those in which ulcers are visible on proctoscopic examination, carbarsone or chiniofon should be given by enema, following a cleansing enema of water. Retention may be aided by the use of a mild sedative. Carbarsone 2 gm. (30 grains) is dissolved in 200 cc. of 2 percent sodium bicarbonate solution (carbarsone is insoluble in water). Chiniofon 4 gm. (60 grains) is dissolved in 200 cc. of sterile water. (Emetine and diodoquin cannot be given by enema.) Such enemas are given every night for five nights. If there is irritation, the frequency of enemas should be reduced to alternate nights. (6) In refractory cases, bacterial infection may be present. In such instances, the use of penicillin or sulfadiazine is recommended. *Amebic hepatitis, hepatic abscess, and other metastatic lesions.* Intestinal infection is usually present also. The recommended treatment includes emetine and diodoquin or chiniofon. Carbarsone should not be given to patients with hepatic disease. (1) Emetine hydrochloride is given as described above, but continued for eight days, provided no toxic symptoms appear. Enetine is followed by diodoquin or chiniofon. (2) Diodoquin is given for seven days, as described above. (3) As an alternative to diodoquin, chiniofon may be given for seven days, as described above. (4) If hepatic abscess is present, the abscess should be drained by aspiration after two to four days of treatment with emetine. However, when the size and location of the abscess suggest that rupture is imminent, aspiration should be performed at once and treatment with emetine instituted at the same time. The site of aspiration should be carefully selected in accordance with the physical findings. The operation should be performed with scrupulous technique in an operating room. Open drainage should not be performed, unless it is demonstrated by smear or culture that the abscess is secondarily infected. Repeated aspiration may be necessary. In instances of secondary infection with susceptible organisms, the use of penicillin or sulfadiazine is recommended. *Follow-up.* The results of treatment should be checked by means of repeated clinical and laboratory examinations. When encysted or motile

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

amebae persist or are rediscovered, a further course of treatment should be given. Symptomatic relapses should be treated vigorously, provided the presence of motile amebae is demonstrated. Courses of chemotherapy should not be repeated merely because of simple diarrhea when amebae are not demonstrated. Patients should not be disposed of or released from medical supervision until three examinations have been negative, at least one of which should be obtained following a saline cathartic.

Prevention. The prevention of amebic infection in military forces consists essentially in supervision of personal hygiene of mess personnel, the detection and adequate treatment of food handlers, the protection of food and drink from flies and other pest insects, the proper purification of water supplies, the sanitary disposal of human excreta, and the avoidance of eating uncooked fruits and vegetables which may be contaminated. When facilities are available, stool examinations for *E. histolytica* should be made on personnel prior to their assignment as food handlers. Native help should be excluded as food handlers at military installations. Eating establishments located outside of military installations which fail to meet sanitary standards in the procurement and serving of food should be declared out of bounds. In tropical or subtropical areas, fresh fruits and vegetables should be cooked before being served. In the field, drinking water can be made safe only by special methods of chemical treatment or filtration, or by boiling. If an adequately filtered or treated water supply is not available, drinking water should be boiled and then chlorinated. For chemical treatment, a concentration of chlorine sufficient to give two parts per million residual after thirty minutes' contact is required to destroy cysts of *Endamoeba histolytica.* When using canteens, two halazone tablets are sufficient to kill cysts, unless the water is turbid or colored, in which case four tablets should be used. In filtration to remove amebic cysts, certain precautions are necessary in the rate of operation of standard portable water purification units and in the pretreatment of the water. The recently standardized diatomaceous earth filter is highly efficient in removing amebic cysts. Sanitary disposal should be made of human excreta to prevent fly breeding. In the field, it is essential that flies be denied access to human feces by fly-proof construction of latrines. Kitchens, mess halls, and latrines should be adequately screened and the destruction of adult flies with insecticides, traps, and fly swatters should be practiced routinely. DDT residual spray should be applied at the rate of 200 mg. per square foot (1 quart per 250 square feet) to screens, walls, ceilings, and light fixtures of mess halls and kitchens. Garbage racks also should be treated. Pit latrines should be treated by spraying the walls of the pit, the inside and outside of the latrine box, and the walls and screens of the inclosure. To control fly breeding in pit latrines, DDT residual spray should be applied evenly over the contents at the rate of 2 ounces per latrine box hole.

CHOLERA

Cholera is an acute enteric infection in which the *Vibrio comma* is the specific etiological agent. Susceptible individuals acquire the disease through the ingestion of food, drink, or other material contaminated by feces which contain the specific organism. Contamination of water is one of the most important means of spreading cholera. Flies may play an important role. There are endemic centers of cholera in India, Burma, southern China, and elsewhere.

Course. The incubation period is usually from one to three days. Premonitory symptoms of depression, lack of energy, and simple diarrhea

Abstract of TB MED 138, Feb. 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

sometimes occur. In epidemics, mild cases may be seen which show only malaise and diarrhea throughout. In ordinary cases, the onset is sudden, with profuse, watery stools which quickly lose all fecal characteristics. Tenesmus is uncommon. Vomiting, which is copious, is often precipitate and free of nausea and retching. Prostration rapidly becomes severe. Dehydration may reach an extreme degree in a very short time. There is great thirst. Patients are apathetic but clear in mind. In addition to huge quantities of fluids, large amounts of mineral metabolites are lost, especially chlorine, sodium, and calcium. There is a strong tendency toward acidosis, and a marked shift may occur in the acid-base balance of the blood. Muscular cramps may be widespread and severe. The circulation is profoundly affected, with peripheral collapse and low blood pressure rapidly developing to marked degree. The secretion of urine often fails and uremia often appears in severe cases. The course is usually run in a few days (average, three to five). In fatal cases, death may occur in a few hours or after several days.

Diagnosis. The possibility of cholera should be brought to mind by epidemiological considerations. In the presence of an epidemic, every person having diarrhea or gastrointestinal disturbance should be regarded as a cholera suspect. Cholera must be separated from: acute bacillary dysentery, in which the stool content is different and tenesmus is present (except in mild cases), and in which collapse is rare in adults; food poisoning, in which distressing vomiting with nausea and retching and headache are common; clinical forms of malaria (chiefly *falciparum* malaria), in which intestinal symptoms and collapse occur; heat exhaustion and other conditions in which a state of shock develops. Cholera is diagnosed specifically by the identification of *Vibrio comma* in stool cultures. Fecal smears stained with carbolfuchsin diluted 1 to 10, showing the *comma* forms with the "fish in stream" appearance, are suggestive. Specimens of feces from cases or suspected carriers should be planted (two or more loopfuls of liquid feces or mucus) without delay in several tubes of alkaline (pH 8.0 to 8.4) peptone water (peptone 1 percent, NaCl 0.5 percent) and incubated at 37° C. for six to eight hours. Examine the surface growth microscopically for typical gram-negative, slightly curved, motile rods. Streak onto nutrient or infusion agar. Typical twenty-four-hour colonies resemble those of the other enteric gram-negative bacilli. Suspected colonies may be tested with specific *V. comma* agglutinating serum using a slide technique and a 1:20 antiserum dilution. Suspicious colonies should be isolated and their identity confirmed by tube agglutination and biochemical study. *V. comma* produces acid without gas in glucose, maltose, mannite, and sucrose. Lactose may become acid in fourteen days. Nitrites are produced from nitrates; indol is positive and gelatin is liquefied. Macroscopic tube agglutinations should be done at 37° C. for two hours rather than at 56° C., since rapid lysis of the vibrio occurs at the higher temperature. It should be noted that *V. comma* is sometimes strongly or completely inhibited on the selective media such as E.-M.B. agar or S S agar used for the isolation of other enteric pathogens.

Treatment. A patient with cholera represents a therapeutic emergency. The prompt institution and intelligent management of therapy are essential. Since it usually happens that a group of patients (often a very large number) must be treated at the same time, some general plan of action should be prepared and adhered to. Patients with subnormal temperatures should be kept warm. During the early stages of the disease, little or no attempt should be made to give the patient food, except such as he may be able to take in liquid form. At present the replacement of fluids and electrolytes is without doubt the most important form of treatment. During the acute stage, patients usually can retain only very little of the fluid taken by mouth

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

(advantage should be taken, however, of any possibility that they can retain fluid taken by this route). Reliance must be placed, therefore, upon intravenous injections. Subcutaneous injections are not recommended. If sufficient supplies of standard solutions and standard sterile distilled water for intravenous administration are not available, solutions should be freshly prepared with distilled water and freshly sterilized. However, in grave emergencies when large groups of patients must be treated, the administration of fluid should not be withheld because of inability to use ideal technique. Plasma and whole blood generally are not necessary in cholera and *may be very harmful.* They should be given only when specific reasons for giving them are known to exist. The criterion which has been most used as a guide in the administration of fluids is the specific gravity of the blood. As the normal value is closely approached, the rate of fluid administration should be slowed, but the patient must be watched to see that further large losses of fluid are not occurring and do not begin again. The specific gravity of the blood may be determined by the copper sulfate method (see *The Bulletin of the U. S. Army Medical Department*, No. 71, December 1943, page 66), if circumstances permit. In general, judgment must be based especially on the blood pressure; but color and consistency of the blood, rate of the pulse, and amount of urine are also helpful. The development of palpitation, restlessness, pain in the chest, coughing, or edema indicates that too much fluid has already been given. In general, physiologic saline is the fluid to be used. A 5 percent solution of glucose in physiologic saline may be used but not more than 50 gm. of glucose should be given in one hour or 400 gm. in twenty-four hours. It is desirable, but not essential, to add thiamin chloride 1 mg. for every 25 gm. of glucose. Some observers believe that hypertonic saline in limited amounts gives better results, especially in early cases (before dehydration is severe). Most patients have an alkali deficit when they come under treatment, and all may develop this condition later if a favorable response is not secured. Hence, it is advised that treatment begin with a limited amount (500 cc.) of alkaline saline solution (sodium bicarbonate 18 gm. and sodium chloride 6 gm. per liter). The further administration of this solution must depend upon observation of the patient. The rate and depth of respiration are not good guides to the presence of acidosis in the acute stage of cholera, though they may be in the later stages. Ketone bodies are not necessarily present in the urine in acidosis due to cholera. Continued lack of urine formation is associated with the development of acidosis. The reaction of the urine may be used, within limits, as a guide to the further need of alkali; 2,000 cc. of fluid should be administered intravenously in the first two hours. Of this amount, 1,500 cc. should be physiologic saline solution with 75 gm. glucose. The remainder of this amount of 2,000 cc. should consist of 500 cc. of alkaline saline solution. This amount of saline solution is almost never sufficient to cover the needs of a patient, although it is often not necessary to supply more alkaline solution. Further physiologic saline solution, often in the amount of 1,000 cc., will be needed every three or four hours in many cases. The value of the sulfonamides and penicillin in the treatment of cholera is uncertain. Because of the frequent failure of renal secretion, it is believed that sulfadiazine and other well-absorbed sulfonamides should not be given by any route. The use of sulfaguanidine is suggested; if it is given, full doses should be administered: 5 gm. four time a day or 3.5 gm. six times a day for four or five days. Penicillin in large dosage should be tried in a suitable series of patients, with adequate controls. No bactericidal or antitoxic serum which is known to be efficacious is available. Digitalis, epinephrine, hypnotics, sedatives, and laxatives are not efficacious in the treatment of cholera and may interfere with the proper treatment of the patient.

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

Prevention. Patients and proved carriers should be strictly isolated. Special care must be taken in the disposal of excreta and vomitus and all articles which are contaminated by them. Patient's clothing, bedding, and eating utensils should be disinfected by boiling. All attendants should soak their hands in an antiseptic solution and wash them with soap and water *immediately* after handling patients or any article contaminated by them. A cholera ward should be screened and remote from any general source of water and from any mess or kitchen. Although cholera vaccination is of proved value, reliance must not be placed upon vaccination as the sole means of preventing cholera. Vaccination is definitely secondary in value to sanitary measures for protection of water and food. When the danger of cholera exists, particular care should be exercised to safeguard water supplies. A chlorine residual of not less than four-tenths part per million (0.4 p.p.m.) should be maintained until water is consumed. All personnel should be specifically directed not to consume water except from sources approved by the surgeon. Food should be eaten only in authorized places, and other establishments should be declared "out of bounds." Native help should be excluded as food handlers at military installations. Personal hygiene, especially the proper cleansing of hands, should be rigidly enforced for all personnel handling food. Fresh fruits and vegetables must be cooked before being eaten. Careful attention should be paid to the washing and disinfection of eating and cooking utensils. The control of flies is especially important in areas where cholera is present. Adequate screening of kitchens, messes, isolation wards, and latrines should be provided and maintained in good repair. In the field it is essential that flies be denied access to human feces by flyproof construction of latrines. Destruction of adult flies by the use of insecticides, traps, and swatting should receive close attention, especially in sick wards, kitchens, mess halls, and latrines. DDT should be used to kill adult flies by applying as a residual spray and to control fly breeding in organic wastes by applying as a spray or powder.

TREATMENT OF CLINICAL MALARIA AND MALARIAL PARASITEMIA

Whenever the possibility of malaria exists, the diagnosis should be considered no matter what clinical picture is presented. When competent examination of the blood is possible, antimalarial chemotherapy should be given only in cases in which the malarial parasite has been found or in cases of urgent illness which admit of no delay. The habitual administration of atabrine or quinine in all fevers in a malarious area, before demonstration of the parasite, is a dangerous practice. Thick blood smears should be examined as soon as possible, each being studied for at least five minutes before being declared negative. If parasites are not found, smears should be made at intervals of less than twenty-four hours for several successive days. Thin smears should be made for use when the species of parasite cannot be determined from the thick smear. Effort always should be made to determine what species of parasite is present. For details of the identification of parasites see TM 8-227. The diagnosis of *falciparum* malaria calls for close observation of the patient for the onset of dangerous symptoms; repeated relapses are unlikely. In contrast, *vivax* malaria is not likely to become suddenly dangerous, but repeated relapses are common. Military operations or lack of laboratory facilities may make it necessary to give antimalarial treatment without laboratory confirmation of the diagnosis. In such cases, keen observation is essential in order to discover cases of meningitis, pneumonia, or other febrile diseases which may simulate malaria.

Abstract of TB MED 72, 10 July 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Choice of Drug

Atabrine. Atabrine is as effective as quinine in the treatment of malaria, and in many respects it is to be preferred. Atabrine has been shown to be curative (in the strict sense of the word) for a high proportion of *falciparum* infections. It is the drug of choice for the treatment of clinical malaria in general. *Quinine.* The intravenous use of quinine is indicated in patients critically ill with malaria. The drug must not be used for routine oral medication. Its use by mouth should be restricted to occasions on which atabrine is not available and to instances of serious intolerance to atabrine. *Totaquine.* This combination of cinchona alkaloids is available for use in selected cases in fixed medical installations. *Plasmochin.* This drug is useless as the sole antimalarial for therapy. The therapeutically effective and seriously toxic doses of plasmochin are separated by a relatively small margin. Plasmochin, therefore, should not be used routinely. When gametocytes persist after routine treatment, a course of plasmochin may be added. *Arsenical and bismuth preparations.* Available evidence indicates that neoarsphenamine, mapharsen, and certain preparations of bismuth are effective in clinical attacks of *vivax* malaria, but that they do not prevent the subsequent occurrence of *vivax* relapses. *These drugs cannot be relied upon to control clinical attacks due to falciparum infections.* Since they present certain serious disadvantages and no known advantage in comparison with other drugs, they should not be used in the treatment of malaria except when atabrine, quinine, and totaquine are not available. *Penicillin.* This drug has been found to have no influence on malaria.

Untoward Effects of Antimalarial Drugs

All available drugs may give rise to toxic reactions. A few individuals are seriously intolerant of each. *Atabrine.* Untoward effects of any type are unusual. Gastrointestinal symptoms are uncommon in association with clinical treatment. Mild excitement occurs in a small percentage of patients treated with atabrine; in rare cases, acute delirium occurs, especially with large doses. Skin rashes and other allergic manifestations rarely occur; in such cases, quinine or totaquine should be immediately substituted for atabrine. Atabrine is a yellow dye. Its staining of the skin bears no relation to any toxic effect. Bluish discoloration of the hard palate, nail beds, conjunctivae, and the cartilages of the nose, ears, epiglottis, and trachea has recently been described in individuals who have taken suppressive atabrine for long periods. The nature of this pigment is unknown. *Quinine.* The administration of quinine leads to few serious untoward effects. Adequate therapeutic dosage, however, is usually accompanied by one or more of the symptoms of cinchonism—viz, tinnitus, dizziness, deafness, tremor, and palpitation. These milder sympotoms indicate effective blood levels, but are objectionable to many patients. Very large doses of quinine may cause more serious intoxication. Amblyopia is a rare but dangerous occurrence. True sensitivity to quinine is more common than to atabrine and may be present in dangerously high degree. Any patient with a history suggestive of an allergic reaction to quinine should be treated with atabrine. *Totaquine.* This preparation causes much the same untoward symptoms as quinine, but gastrointestinal disturbances, including nausea, vomiting, and abdominal pain, are more frequent and more severe than they are following quinine. *Plasmochin.* In therapeutically effective dosage, this drug is frequently associated with toxic manifestations. The symptoms include abdominal pain, nausea, vomiting, headache, dizziness, and drowsiness. Hemoglobinuria, cyanosis and circulatory collapse, jaundice, and acute yellow atrophy of the liver are rare but exceedingly dangerous effects.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Recommended Treatment for Clinical Malaria

Uncomplicated malaria (patient able to retain oral medication) and parasitemia without symptoms. Atabrine dihydrochloride (quinacrine hydrochloride USP) 0.2 gm. (3 grains) and sodium bicarbonate 1 gm. (15 grains) by mouth with 200 to 300 cc. of water every six hours for five doses, followed by atabrine 0.1 gm. (1½ grains) three times a day after meals for six days (total 2.8 gm. in seven days). *Malaria with persistent vomiting, coma, impending coma, or high density of falciparum parasites in blood smears (5 percent or more of red cells infected).* In these cases, and whenever a patient cannot retain or fails to respond to oral medication, even though he may not appear critically ill, atabrine should be given intramuscularly or quinine should be given intravenously. Atabrine by the intramuscular route is also recommended for patients with serious complicating diseases, such as dysentery, pneumonia, meningitis, or grave injuries. (1) Atabrine dihydrochloride 0.2 gm. (3 grains) in 5 cc. sterile distilled water injected *intramuscularly* into each buttock (total 0.4 gm. or 6 grains), with the usual precautions. Effective plasma concentrations are attained in fifteen minutes and maintained for about six hours. If necessary, one or two additional doses of 0.2 gm. (3 grains) may be given intramuscularly at intervals of six to eight hours. As soon as the patient can take and retain oral medication, atabrine should be given by mouth in such doses as to give a total by both routes of 1.3 gm. in forty-eight hours, followed by 0.1 gm. three times a day after meals for five days (total 2.8 gm. in seven days). (2) Quinine dihydrochloride 0.6 gm. (10 grains) in sterile physiological saline 300 to 400 cc. (minimum 200 cc.) injected *intravenously* with the usual precautions, especially avoiding speed. If necessary, there should be no hesitation to cut down to the vein. The drug is almost immediately effective, but is eliminated in about three hours. This treatment may be repeated in three to four hours, if necessary, but it is preferable to anticipate the need by the intramuscular injection of atabrine immediately following the intravenous administration of quinine. As soon as the patient can take and retain oral medication, a complete course of atabrine should be given, as described above (taking into account any intramuscular doses of atabrine; the total amount should be 2.8 gm. in seven days).

Deviations from the recommended plan should be limited to cases in which there are well-defined indications. In cases in which it is necessary to use quinine by mouth, the recommended dosage is: quinine sulfate 1 gm. (15 grains) three times a day after meals for two days, followed by 0.6 gm. (10 grains) three times a day after meals for five days (total 16 gm. in seven days). The dosage of totaquine is the same as that of quinine sulfate. When plasmochin is used, the recommended dosage is: plasmochin naphthoate 0.02 gm. (1/3 grain) and sodium bicarbonate 1 gm. (15 grains) by mouth three times a day after meals for four days. The fluid and sugar intake should be liberal during and for some days after the course. (Note that the dose of plasmochin naphthoate, 0.02 gm., is the equivalent of the dose of 0.01 gm. formerly recommended which was in terms of plasmochin hydrochloride.) Plasmochin should not be given with atabrine.

General Care

In places where anopheline mosquitoes may be present, the patient should be kept in bed in a screened ward or under a mosquito bed net. The fluid intake should be maintained at 3 to 4 liters per twenty-four hours. If sweating is or has been profuse, the sodium chloride balance should be restored and maintained by giving supplementary amounts of salt. Antipyretics are contraindicated, since they frequently cause marked fall in temperature, sometimes with collapse. If a sedative is necessary, one of the barbiturates should be used judiciously.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

AVOIDANCE OF RELAPSES OF VIVAX MALARIA BY SUPPRESSIVE MEDICATION

Avoidance of relapses. In most instances, general health does not suffer from recurrent attacks of *vivax malaria*, which tend to become shorter and milder. Relapses are considered to be unusual after two years from the date of infection. If relapses are frequent and numerous, they may interfere with military efficiency and impair morale. Proper administration of suppressive medication is highly effective in preventing acute attacks. It is impracticable, however, to use this procedure in an endeavor to prevent all relapses in the United States and other well-sanitated areas. Suppressive medication should be used, however, in numerous individual instances in which the avoidance of relapses is particularly desirable.

Indications. Following completion of regular treatment for an acute attack of *vivax* malaria (see TB MED 72), it is often desirable to ensure an intermission of sufficient length to permit individuals fully to regain their health. Clinical treatment, therefore, in many cases should be followed immediately by suppressive medication, which should be continued for three months unless contraindications arise. Patients whose sole diagnosis is malaria should be disposed of by return to a duty status as soon as their condition warrants. Commanding officers should be notified of the instructions given to patients. Patients who are known to have had an attack of *vivax* malaria within six months and who are under treatment for injuries or diseases other than malaria should receive suppressive medication for one, two, or three months according to the circumstances of the individual case, unless contraindications exist. *Assignment to oversea service.* Commissioned officers and warrant officers who are selected for oversea assignment and who are known to have had an attack of *vivax* malaria within six months should be given suppressive medication to enable them to carry out such assignments. This treatment should be continued for at least three months.

Precautions. Care should be taken not to prescribe as a suppressive a drug to which an individual is known to be sensitive. Personnel should receive instruction in the need for regularity in dosage and the danger of overdosage.

Drugs and dosages. Atabrine is the drug of choice, but in cases of intolerance to atabrine, quinine may be substituted for it (see TB MED 72). *Atabrine dosage.* If no atabrine has been taken for three weeks or more, "loading doses" of 0.1 gm. (1½ grains) three times a day for three days should be given at the start. This should be followed by a daily dose of 0.1 gm. (1½ grains). *Quinine sulfate dosage.* Daily doses of 0.6 gm. (10 grains).

Abstract of TB MED 136, Jan. 1945.

PLAGUE

Plague, an acute infectious disease caused by *Pasteurella pestis*, is transmitted from rat to rat and from rat to man by certain fleas. Plague may be contracted from human cases through contact with the discharge from buboes or from the respiratory tract. The disease is widely but unevenly scattered in many endemic foci from which it may spread along lines of travel. The most important foci are in India and China.

Course. The incubation period is from two to ten days. As a rule, the onset is sudden with high fever and great prostration. There is a marked tendency to dehydration. In some cases superficial blebs, petechiae, purpuric spots, and hemorrhages from various parts of the body occur. Delirium,

Abstract of TB MED 124, Dec. 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

convulsions, or coma may develop. Cases of plague are usually divided into three types which may not, however, be distinct from one another. These types are bubonic, pneumonic, and septicemic plague. Bubonic plague is characterized by enlargement on the second or third day of lymph nodes draining the portal of entry. Buboes usually become soft and suppurate; they may rupture and discharge thin contents. Case fatality rates vary, but are usually 30 percent or more. In pneumonic plague there is cough, thin, bloody sputum, dyspnea, and diffusely scattered rales. Recovery is unusual. Septicemic plague is characterized by immediate prostration and the development of hemorrhages and skin lesions. It is almost invariably fatal.

Diagnosis. It is important to recognize sporadic cases. The diagnosis should be suspected on epidemiological and clinical grounds. (*WARNING: All infectious material must be handled with the greatest care.*) The specific diagnosis of plague is made by staining, culture, or animal inoculation of infectious material from sputum, aspirated bubo contents, or blood. (See TM 8-227.)

Treatment. The patient must be immediately put to bed and strictly isolated. Good general medical and nursing care is essential. The total intake of fluids should be regulated to ensure a daily urinary output of at least 1,500 cc. If necessary, fluid should be administered by vein. It is most important to initiate treatment with a sulfonamide without delay after the diagnosis has been established. Sulfadiazine is the drug of choice. Sulfathiazole may be used. Therapy must aim at high blood levels of from 15 to 20 mg. per 100 cc. during the first four or five days of the disease. Whenever possible, blood level determinations should be made at regular intervals and the dosage adjusted to maintain high levels. The initial dose by mouth should be 4.0 gm. (60 grains) with sodium bicarbonate; subsequent doses 1.5 to 2.0 gm. (22½ to 30 grains) every four hours day and night until temperature is normal. Then continue with 0.5 gm. (7½ grains) every four hours for at least ten to fifteen days after the temperature is normal. A gradual reduction in the blood level to 10 to 15 mg. per 100 cc. is indicated when the patient shows improvement. In fulminating cases or when treatment has been delayed, sodium sulfadiazine (5 percent solution in sterile distilled water) should be given intravenously: Initial dose, 6 to 8 gm. (90 to 120 grains), given slowly; subsequent doses, 3 or 4 gm. every six hours. Change to oral dosage as soon as possible. Penicillin is ineffective in the treatment of plague. No therapeutic serum is available at present. Hot, wet applications to buboes may be helpful. Incision should be delayed until localization is complete in order to avoid blood stream infection.

Prevention. Patients should be kept in separate screened rooms and only attendants allowed to enter. In pneumonic or suspected pneumonic cases, attendants must wear hoods with goggles or plastic eye openings, coveralls or complete gown with trousers, and rubber gloves. All articles contaminated by discharges are to be burned. Bedding, linens, and utensils in contact with the patient should be sterilized by boiling or autoclaving. The area where an infection was acquired or where contacts may have occurred should be placed off limits until the danger is past. If a pneumonic case occurs, contacts and suspected contacts should be segregated and observed. Any person developing fever should be isolated regardless of cause. Close contact with segregated persons should be avoided. Inspecting personnel should wear gowns, coveralls, caps, masks, and rubber gloves. The rat population in endemic areas should be closely watched and any increase of rodent plague met by adequate control measures. All buildings and ships should be ratproofed. Rat extermination campaigns should be conducted by sanitary platoons or other trained personnel. Destruction of fleas in

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

hospitals, barracks, mess halls, and storerooms should accompany rodent-control programs. Rat harborages should receive special attention. Because of its persistent effect, DDT is the pulicide of choice. It may be applied as a dust or in liquid form in kerosene solution. Repellents may be applied to exposed skin or to clothing in the manner described for mosquitoes. While they do not prevent fleas from alighting, the fleas leave the treated surface almost immediately and do not bite. All military personnel under serious threat of exposure to human plague should be immunized with plague vaccine.

SCRUB TYPHUS FEVER
(Tsutsugamushi Disease)

Scrub typhus fever is a specific febrile disease caused by a rickettsia (*Rickettsia orientalis*) and transmitted by a mite. The disease is basically a disseminated focal vasculitis and perivasculitis of the smaller blood vessels. The vessels principally involved are those of the skin, lungs, heart, and brain. Scrub typhus has a wide geographical distribution in the Asiatic-Pacific area. It is transmitted to man by the larval form of a mite of the genus *Trombicula*. Larval mites become infected while obtaining a blood (serum) meal from a vertebrate host that is infected. It is probable that field mice, rats, or other animals, such as the bandicoot, serve as the natural pool of infection in various areas. The danger of infection appears to be associated principally with terrain in which there is moist, damp soil favorable to the growth and activity of the specific mite. The risk of infection is particularly great when an organization moves into and occupies new areas.

Clinical features. Following an incubation period of from ten to eighteen days, the onset of the disease is sudden and is associated with headache, chilliness, and fever. During the first week, the fever rises in a stepwise fashion, reaching from 102° F. to 105° F., by the beginning of the second week of disease and, ordinarily, remaining elevated until the beginning of the third week. There may be wide swings in the temperature curve. Headache may increase in intensity and become quite severe. The patient becomes apathetic, and, in severe cases, a muttering, restless delirium is observed. Anorexia is common. A small necrotic ulcer, 2 to 10 mm. in size, called the eschar, is frequently seen at the former site of attachment of the infected mite. It is frequently covered with a black scab, but in moist surface areas of the body the black central scab is lacking. It is present at admission and usually persists during the active period of illness. A characteristic skin eruption, ordinarily consisting of slightly raised, dull or raspberry red macules, appears on the trunk from the fifth to the eighth day. This rash ordinarily fades within several days, but at times may be of an evanescent character. The distribution of the rash may extend to the arms and legs and at times assume a maculopapular character. An almost constant finding is generalized lymphadenitis of variable degree which appears early in the disease and persists for the duration of the active stage. The regional lymph nodes draining the eschar are likely to be more enlarged than elsewhere and somewhat tender. A slightly enlarged, tender spleen appearing at the end of the first week is common. Confusion, disorientation, muscular twitching, nystagmus, and even convulsions may be observed. Variable degrees of deafness, ordinarily transient, have been reported. Cough early in the disease is frequent, and physical signs of pneumonitis are present. Frank dullness and tubular breathing are absent, but these

---

Abstract of TB MED 31, 11 Apr. 1944.

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

may be found when a secondary bacterial pneumonia develops as a complication. Variable degrees of myocarditis may be present. In severe cases, tachycardia, hypotension, and signs of pulmonary congestion may be present.

Laboratory findings. There is no specific blood picture in scrub typhus. The presence of agglutinins for the *Proteus* OXK bacillus can usually be demonstrated in the patient's serum by the end of the second week. With a properly standardized and controlled antigen, a titer of 1:160 may be regarded as significant, although a diagnostic OXK agglutination test is best interpreted by a rise and fall in titer. Even a negative agglutination test does not exclude scrub typhus. The agglutination titer usually reaches its peak during the third week, begins to decline rapidly in convalescence about the fourth week, and becomes negative several weeks later. In occasional cases, the plasma proteins may be slightly lowered during the second and third weeks. There is a frequent fall of the albumin-globulin ratio. In most cases, a definite hypochloremia develops during the second and third weeks. Isolation of the causative rickettsia from the patient's blood, by injection into mice, in the early stage of the disease is relatively simple. The technique is described in detail in the TB MED.

Differential diagnosis. The characteristic primary lesion and Weil-Felix reaction (positive OXK, negative OX 19 and OX 2 agglutinations) serve to separate scrub typhus from the other members of the typhus group. In the case of dengue, malaria, and infectious hepatitis, early differential diagnosis depends upon finding an eschar. The skin eruption, appearing on the fifth to eighth day, may be of diagnostic value. Final diagnosis is confirmed by a diagnostic OXK agglutinin test. Recovery of the causative rickettsia from the blood by inoculation of white mice, and its identification, proves the diagnosis.

Treatment. There is no specific treatment of established value. Neither the sulfonamide drugs nor penicillin has any effect on the course of the disease, and these drugs should not be used unless proved secondary bacterial infections develop during the course of illness. The most important aspect of treatment is that of good nursing care. Complete bed rest, avoidance of overexertion, frequent small feedings of food (by the nurse, in cases of severely ill patients), adequate fluid intake, and alcohol sponges for high fever should be stressed in such care. From 6 to 8 gm. of salt a day should be administered in hot climates, preferably by mouth or by hypodermoclysis. Intravenous fluid, if required, should be given slowly and in small amounts. Aspirin for headache may cause violent swings of temperature and profuse sweating; its use, therefore, should be avoided. Sedatives should be used judiciously. When patients with pulmonary complication become cyanotic, oxygen is indicated. Digitalis is not indicated in acute myocarditis and its use, therefore, should be avoided unless there is convincing evidence of congestive heart failure. The use of intravenous plasma should be limited to those cases having a proved hypoproteinemia sufficiently severe to threaten the development of generalized edema.

Prevention. There is no protective vaccine against scrub typhus. Locations which are to be used as new camp sites should be prepared as fully as possible before the arrival of a new unit, employing native labor whenever it is available. All grass and scrub should be cut level with the ground and burned or hauled away. It is highly desirable to burn over the camp area with a power oil sprayer or flame thrower. Sleeping on the ground should be avoided. Clothing impregnated with a 5 percent emulsion of benzyl benzoate dibutyl phthalate or dimethyl phthalate affords the best individual protective measure against mites. These chemicals, which are designated as Repellent, insect, clothing treatment (QM Stock No. 51-R-300),

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

kill the larval mites before they attach to the skin. The technique of impregnation using dimethyl phthalate with G.I. soap as an emulsifier is described in TB MED 121. Since the above miticides vary in their resistance to washing, and later issues contain an emulsifier, eliminating the need for using soap, the labels of all bulk repellents should be examined carefully to determine the contents and specific instructions for use. When impregnation is not practicable, application of bulk or individual issue repellent by spraying or by hand provides an expedient method. Washing reduces or removes repellent from treated clothing.

SANDFLY (PAPPATACI, PHLEBOTOMUS) FEVER

General. Sandfly fever is an acute infectious disease caused by a filtrable virus and transmitted to man by the bites of infected sandflies (*Phlebotomus papatasii*). The insect vector is a small, hairy fly. Only the female bites and, as a rule, only during the night hours. About one to two weeks after the primary exposure to bites, markedly inflamed papules usually appear at the sites originally bitten and persist for four to five days. Once sensitization is established, such papules appear earlier after subsequent bites and there may be an intense urticarial reaction. *P. papatasii* breeds in dark, aquatic spots containing moist organic matter. The larvae are not aquatic.

Clinical manifestations. Following an incubation period of three to seven days there is an abrupt onset of fever, severe headache, malaise, and aching in the back and extremities. Pain behind the eyes and photophobia are frequent. The temperature usually reaches its peak within twenty-four to forty-eight hours after onset and the elevation may be marked. The febrile period in the majority of cases is two, three, or four days. Secondary rises of temperature may occur. No fatalities are recorded. There are erythema of the face and exposed parts of the neck and chest, conjunctival injection, tenderness of the eyeballs, and some congestion of the pharynx. Lymphadenopathy is rare or absent. Enlargement of the liver or spleen is not part of this disease.

Clinical laboratory data. Leukocyte counts should be done at least every other day. A true leukopenia may be observed in 90 percent of cases at some time during the febrile period. The differential count is an essential part of the study since it reveals important changes whether or not a true leukopenia develops. Characteristically there is, at the onset of fever, a normal white blood count with a decrease in lymphocytes. During the second or third day of fever the number of lymphocytes begins to return to normal. At the same time there is a fall in the number of segmented neutrophils and a marked increase in immature neutrophils. There is a return to the normal picture five to eight days after defervescence.

Differential diagnosis. The diagnosis of sandfly fever must be made on clinical and epidemiological grounds. Differentiation from dengue is aided by the shorter duration of fever in cases of sandfly fever, and the absence of lymphadenopathy, and a rash. Differentiation from grippe may be aided by leukocyte studies. Influenza epidemics are rare in hot summer or autumn months and signs of respiratory tract inflammation usually accompany this disease.

Prevention. Camp sites should be located on open, elevated, dry, sandy ground when feasible and as far from native dwellings and domestic animals as possible. The area within a radius of 50 to 100 yards of sleeping quarters should be cleared of rubble, detritus, gardens, vegetation, and need-

---

Abstract of TB MED 82, 8 Aug. 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

less earthen walls or banks. When such measures are impracticable, the area should be sprayed with DDT residual spray. Ordinary screens and bed nets do not exclude sandflies. Occupants of buildings may be effectively protected by the application of DDT residual spray to the inner walls, ceilings, and fixtures and to the inside and outside of screens and doors, including a foot or two of the outer wall around their casements. Additional protection may be secured by spraying twice daily with an aerosol dispenser or other available insecticide. After sundown long-sleeved shirts and full-length trousers should be worn. Insect repellent should be used on exposed parts of the body. Protection against bites of sandflies lasts for four to six hours.

Management of patients. The disease is self-limited, and no specific therapy is available. Patients should be hospitalized and isolated in separate wards. Insect repellents and fine mesh nets should be used.

CUTANEOUS DIPHTHERIA

Diphtheria is a constant threat to military personnel. Medical officers should be aware of the danger of epidemics and alert to recognize cases of diphtheria. They are frequently unfamiliar with the well-established fact that virulent diphtheria organisms may infect both wounds and skin lesions. Clinical evidence strongly suggests that pharyngeal and cutaneous diphtheria are epidemiologically related and indicates the possibility of infection of the pharynx from skin lesions and the reverse.

Clinical features. Systemic reaction is usually absent in cutaneous diphtheria. No type of skin lesions is pathognomonic. In general, the occurrence of cutaneous diphtheria depends upon the accidental introduction of the organisms into an existing lesion. The skin lesion most commonly infected with diphtheria bacilli is a deep ulcer, from 2 millimeters to several centimeters in diameter. The margin is sharply defined, declivitous, indurated, often rolled, and occasionally undermined. The base is usually relatively clean but sometimes is covered with fibrinopurulent material or a fibrinous crust. Usually, there is a zone of induration, erythema, and violaceous pigmentation about the lesion. The ulcers are usually multiple, but may occur singly. Although virulent diphtheria bacilli are most frequently isolated from this type of lesion, they have been recovered from a variety of other skin conditions. They are among the occasional secondary invaders of deeper wounds. The role of diphtheria as a cause of neuritis in troops has been underestimated. Cutaneous or wound diphtheria as an antecedent to diphtheritic neuritis is probably less frequently recognized than pharyngeal diphtheria. About one-fifth of a recently studied group of cases of diphtheria of the skin were found to have peripheral neuritis. The lower extremities are most often involved. Electrocardiographic evidence of myocarditis occurs in approximately 5 percent of cases of cutaneous diphtheria.

Diagnosis. The diagnosis of cutaneous diphtheria depends first on thinking of it as a possibility, and second on laboratory confirmation. Suspicion that one is dealing with cutaneous diphtheria should be aroused if ulcers such as described above are present. This suspicion should be increased if there is a group of patients with suspected ulcers, originating in a common area, or if clinical evidence of nasal or pharyngeal diphtheria or of characteristic complications of diphtheria appear in these patients or individuals associated with them. Manifestations of myocarditis are likely to appear suddenly and early. On the other hand, those of neuritis develop insidiously and may appear only after very long intervals, such as two to

Abstract of TB MED 143, Feb. 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

four months. The amount of protein in the spinal fluid may be increased. When diphtheria is epidemic, not only patients with suggestive ulcers but also patients with eczematoid and exfoliative lesions should be isolated until they are proved to be nondiphtheritic. When the characteristic morphological structure is noted in a film from an initial Loeffler slant or a suspected lesion, it may be considered as presumptive evidence for the presence of *Corynebacterium diphtheriae.* (See TM 8-227.) Direct smears are rarely of value because of the heavy contamination of most skin lesions; nevertheless, they should be employed in suspected cases. Loeffler's medium is the most widely employed preparation for the cultivation of corynebacteria, though Pai's egg medium is a moderately suitable substitute. Adequate growth is usual in twelve to eighteen hours, in the form of small, moist, grayish, shiny colonies. After such incubation, the entire growth should be emulsified on the slant. A methylene blue stained film is prepared and examined for *C. diphtheriae* and a plated medium (in order of preference: cystine-tellurite blood agar of Frobisher, tellurite blood agar, or whole blood agar) is streaked. Transfers are made from suspicious colonies on the plate to Loeffler's slants. *C. diphtheriae* will generally ferment dextrose and not sucrose in five days at 37° C. Cultures of organisms with such properties are used for animal virulence tests. The reaction of experimental animals to the inoculation of suspected diphtheria organisms is the only certain method of determination of virulence (see TM 8-227).

Treatment. Patients with diphtheria of the skin are subject to all the complications that may develop in the nasopharyngeal form of the disease, and these complications should be guarded against and treated promptly in case they appear. The application of sterile warm saline compresses to the skin lesion is recommended. Such treatment, combined with general care, usually suffices to clear the lesion of diphtheria organisms, but compresses soaked in penicillin solution (250 to 500 Oxford units per cubic centimeter) give a quicker effect. When it is decided after careful epidemiological and clinical consideration that a patient probably has cutaneous diphtheria, antitoxin should be given without delay. If a clinical diagnosis is not justified, the results of laboratory studies should be awaited. In cases in which only cutaneous lesions are infected and no complication is present, the recommended amount is 20,000 units, administered intramuscularly in a single dose. The usual precautions to prevent anaphylactic reactions to foreign proteins must be rigidly employed. Further administration of antitoxin in such cases must depend upon the clinical findings and course. Patients with nasopharyngeal diphtheria as well as cutaneous diphtheria should be treated according to the usual principles for the management of nasopharyngeal diphtheria.

Control. The administrative procedures prescribed in AR 40-210 for the control of diphtheria are applicable to the cutaneous form of the disease. The following considerations should be borne in mind: (1) Individuals known or strongly suspected of harboring *C. diphtheriae* in cutaneous lesions should be considered carriers and isolated accordingly. (2) Contacts to cases of cutaneous diphtheria should receive the same attention as contacts to nasopharyngeal cases. (3) Stations receiving troops, who may have been exposed to cutaneous diphtheria, should be alert to the possibility of faucial or cutaneous diphtheria. *Isolation.* Strict isolation technique should be employed in the same manner for cutaneous diphtheria as for the nasopharyngeal type. (1) Particular attention should be given to the disinfection of dressings and other articles contaminated with discharges from the lesions. Special care must be taken in the proper cleansing and disinfection of the floors in wards in which these patients are being treated. Under no conditions should dry sweeping be allowed. (2) No person should be per-

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

mittted to act as attendant for cases of cutaneous diphtheria unless Schick negative. *Immunization* (see TB MED 114). Immunization of large groups of military personnel should be undertaken only under special circumstances. While immunity to diphtheria toxin does not prevent the multiplication of diphtheria organisms in skin lesions, it should prevent systemic damage from the toxin, and also prevent an attack of nasopharyngeal diphtheria. The decision for or against immunization must be based on the circumstances of the outbreak, but the following tentative indications are offered for guidance: (1) Admission rates for diphtheria (either or both forms) above 100 per 1,000 per annum when averaged over a period of several weeks except that (2) when the disease is limited to small organizations or units, that is, 1,000 strength or less, the critical rate might well be considered to be 200 per 1,000 per annum and (3) in large organizations, that is, 20,000 or more, the critical rate might be considered to be 50 per 1,000 per annum or less. (4) Situations in which admission rates are not considered reliable but in which there is definite indication of the spread of diphtheria. The recommended method for immunization of adults to diphtheria is given in TB MED 114. Schick testing of large groups of military personnel under field conditions is not ordinarily practicable. For details concerning this procedure, see TB MED 47.

FILARIASIS (WUCHERERIA) WITH SPECIAL REFERENCE TO EARLY STAGES

Filariasis is an infection of the lymphatic system with nematode worms of the genus *Wuchereria*. The best known and most widely distributed species is *W. bancrofti*. The only other known species is *W. malayi*. Although filariasis is widespread among natives of practically all tropical regions, a high incidence of infection is usually found only in limited areas. The adult worms live in the lymphatic system of man. Female worms release large numbers of sheathed microfilariae (which are prelarval forms) into the lymph and blood streams. In most endemic areas microfilariae of *W. bancrofti* or *W. malayi* are present in the peripheral blood of infected individuals in greatly increased numbers at night and the mosquitoes which act as intermediate hosts are commonly night-biters. In the mosquito, the microfilariae taken up with the blood develop into infective larvae, which migrate into the mouth parts of the mosquito. When mosquito bites again, these larvae are liberated and penetrate the human skin to start a new infection. A high incidence of infection in the human population and a heavy density of efficient mosquito vectors are apparently required for the spread of filariasis. Prolonged exposure increases the chance of acquiring the disease. *Culex quinquefasciatus* (*C. fatigans*), is generally considered the most important vector of the periodic type of *W. bancrofti*.

Course. In all probability, many infections remain asymptomatic for years, or even for their duration. It is commonly believed that a period of a year usually elapses between exposure and the development of symptoms. *Early symptoms and signs.* Clinical manifestations occur in a series of acute attacks which last from five to six days or for several weeks. Recurrences are not periodic. In the intervals, patients may appear to be in normal health. Acute attacks vary greatly in severity, being sometimes very mild or hardly noticeable and sometimes incapacitating. Among the symptoms are lack of energy and stamina, constant fatigue, anorexia, nausea, headache, vertigo, drowsiness, blurring of vision, photophobia, and muscle spasm. Pain is common, but rarely severe. It occurs in the chest, lower abdomen,

---

Abstract of TB MED 142, Feb. 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

muscles, and in association with local swellings and lymphangitis. Fever, chills, and prostration are unusual, except in mild degree. Neurotic symptoms are frequent, and mental depression may be severe. The physical signs are largely those of enlarged lymph nodes, other localized swellings, and lymphangitis. Involvement of the genitalia is especially frequent, with retrograde funiculitis, epididymitis, orchitis, varicocele, and edema of the scrotal skin. Swollen discrete lymph nodes appear in the inguinal, cervical, axillary, or epitrochlear regions. Lymphangitis may develop in the arms, neck, or thighs. It proceeds in a centrifugal direction, in association with a red streak, under which the enlarged vessel may be palpable. In some instances, circumscribed, localized areas of swelling occur in the arms or legs. Urticaria is occasionally seen. Leukocytosis is present in about one-third of the cases. Eosinophilia occurs in two-thirds of cases. The swellings which have been mentioned usually involve the genitalia and one or more extremities. All of the changes described may develop rapidly and may regress just as quickly. Repeated or prolonged attacks occasionally leave behind them enlargements or thickenings, usually of lymph nodes or genitalia (especially the spermatic cord), which are rarely marked but may be detectable in the intervals between acute attacks. The clinical manifestations have no relation to the presence of microfilariae in the blood. *Late symptoms and signs.* As a rule, the manifestations which characterize the later stages of filariasis are associated with permanent changes in the tissues. The characteristic developments include lymph node enlargement and elephantiasis. Elephantiasis consists of permanent, extensive thickening and swelling of the soft tissues, with enlargement of the part affected. The genitalia and the extremities, especially the legs, are most often involved. At least in part, the change is a consequence of more or less complete occlusion of the local lymphatic drainage. Some investigators believe that bacterial infection plays an important etiological role. The development of late manifestations has no relation to the presence of microfilariae in the blood.

Diagnosis. The diagnosis of filariasis should be made not only when the presence of the disease is proved by the demonstration of microfilariae or adult worms, but also when the history and clinical findings provide sufficient evidence thereof. Exposure to the disease in an area where it is known to be endemic is essential in diagnosis. Exercise tests, particularly marching, are helpful, if they precipitate acute attacks. The demonstration of microfilariae or of the adult worm is the only proof of the presence of filariasis. Microfilariae may be discovered in preparations of the blood or aspirated contents of a lymph node or hydrocele. In general, they are present in the circulating blood in greatly increased numbers at night. In cases showing early manifestations of the disease, the concentration method of Knott should be used. A brief description follows: Withdraw 1 cc. of blood from a vein and discharge into 10 cc. of 2 percent formalin solution in a 15 cc. conical tip centrifuge tube. Thoroughly mix and set aside to sediment for twelve to twenty-four hours. Decant the supernatant fluid and with a capillary pipette containing a small amount of water remove the sediment and make an even, fairly thin smear on a glass slide. When dry, stain with Loeffler's methylene blue for two or more minutes, rinse free of excess stain, and when dry, counterstain for one to two minutes with 1/3 of 1 percent aqueous solution of eosin. Giemsa stain may also be used. In the formalized sediment the microfilariae lie stretched out and not in the graceful curves seen in thin and thick blood smears. In the complete absence of acute manifestations and under expert guidance, a lymph node may be removed for study. The removal of other tissue is undesirable at any time.

Treatment. During acute attacks, patients should be kept in bed. Compresses, either hot or cold, should be applied over local inflamed areas.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

When swellings appear, the part should be elevated. In the presence of acute manifestations, all surgical operations are considered undesirable, except such as may be clearly indicated as emergency measures. No efficacious specific chemotherapeutic agent is known. Sulfadiazine may be given in cases in which evidence exists of secondary infection with susceptible bacteria. It is justifiable and desirable to reassure patients and to explain to them that, although they may have further transient attacks, the chance of serious permanent damage is negligible.

Prevention. The prevention of filariasis depends primarily upon segregation of troops from infected native populations, control of mosquito vectors, and individual protection from bites of mosquitoes. Since infected natives serve as the source of infection for troops, the maintenance of a safe distance between the two groups and a restriction of their association to a minimum is of the utmost importance for the prevention of the disease in military personnel. Camp sites should be located at least one mile from native habitations. Native villages should be declared out of bounds at all times. Numerous species of mosquitoes with varied feeding habits and biology transmit filariasis. In the absence of specific information, methods directed at the control of all species of mosquitoes should be employed. Larvicidal measures including those employed in malaria control (see TB MEDs 14 and 164) should be instituted. In addition to anopheline habitats, careful attention must be given to the numerous types of natural and artificial water collections which serve as breeding places for *Culex* and *Aedes* mosquitoes. Thorough policing of camp areas for tin cans, coconut husks, oil drums, tire casings, and other sources of mosquito breeding should be practiced routinely. Particular emphasis should be placed on measures directed against adult mosquitoes, including the application of DDT residual spray to troop quarters and to native huts (see TB MED 110), screening, and routine insecticidal spraying of all buildings and quarters. The treatment of native habitations with DDT residual spray is especially important, because this procedure has long-lasting effects and will kill many mosquitoes soon after they become infected. Personal antimosquito measures, such as use of insect repellent and mosquito bars, should be practiced routinely. Long-sleeved shirts and full-length trousers should be worn at all times during the day and after sundown.

VISCERAL LEISHMANIASIS—KALA-AZAR

Visceral leishmaniasis or, as it is commonly known, kala-azar, is a disease found in Asia, Africa, Europe, and South America. *Leishmania donovani*, the causal organism, is a protozoan parasite which belongs to a group known as hemoflagellates that inhabit the blood or other tissues of vertebrates. Two forms of *Leishmania donovani* are present in its life cycle, the leishmania form, a stage lacking a flagellum, which occurs in man or other mammalian hosts, and a leptomonad or flagellate form which develops in the sandfly intermediate host and in artificial culture media. Leishmania forms, commonly referred to as Leishman-Donovan bodies, are small ovoid or round unicellular organisms measuring 2 to 4 microns in diameter which occur in reticulo-endothelial cells and macrophages. The leishmania forms grow and multiply at the expense of the host cells which they parasitize.

Transmission. Sandflies of the genus *Phlebotomus* are chiefly responsible for the transmission of visceral leishmaniasis. These minute blood-sucking vectors are hairy, mothlike insects, capable of penetrating standard mosquito netting and screening. The larvae develop in dark, slightly moist places. As with mosquitoes, only the adult females feed on man or animals.

Abstract of TB MED 183.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Their bites often cause a severe local reaction. In many endemic areas, man constitutes the most important reservoir of infection. In certain areas, such as China, where natural canine infections occur, dogs also may play a part in the epidemiology.

Clinical picture. The incubation period varies. In most cases, it is believed to be within two to six months. The onset also varies. Sometimes it is very slow and insidious, and sometimes it is well defined with a gradual development of high fever over a period of five to seven days. The symptoms include fever, chills, dizziness, headache, anorexia, cough, sweating, constipation, weakness, loss of weight, diarrhea, malaise, epistaxis, abdominal discomfort, nausea and vomiting, and bleeding gums. The temperature curve, which assumes a variable form, usually shows an irregular remittent or intermittent fever. Occasionally, there are wide swings of temperature. Double and even triple rises in temperature may occur during a single twenty-four-hour period. In early cases the physical examination may reveal little. Enlargement of the spleen is characteristic of established infections with kala-azar. The liver is also enlarged, but the enlargement appears to take place somewhat later than that of the spleen. Tenderness of spleen or liver is unusual. Jaundice and ascites are rare. An important finding in some cases is enlargement of lymph nodes. After kala-azar has been active for weeks or months, wasting appears. When blood changes are advanced, pallor and other signs of anemia may be seen. In time, the skin tends to acquire a dusky hue. In unusual instances, chiefly in patients who have been treated inadequately, specific macular or nodular skin lesions may develop, most commonly on the cheeks and nose. They contain Leishman-Donovan bodies. Patients with kala-azar appear to be peculiarly susceptible to other infections. Stomatitis is common in neglected children. Bronchitis and pneumonia are the commonest secondary infections.

Clinical diagnosis. The diagnosis should always be confirmed by demonstration of the parasite. The outstanding considerations, apart from demonstration of the parasite, are exposure to the disease, the type of onset and temperature curve, palpable spleen and, usually, palpable liver, and the blood changes. *Blood studies.* The earliest change in the blood is a fall in the total leukocyte count which is due largely to a decrease in granulocytes and occurs in 80 percent of the cases. In occasional instances, agranulocytosis develops. In established infections anemia is the rule and may be very severe. The plasma proteins undergo a marked change which results in reversal of the albumin-globulin ratio and increase of the globulin fraction. The relationship of these changes to the aldehyde test, antimony test, and distilled water test is uncertain. The details of these tests are outlined in TB MED 183. They are not specific for kala-azar and may be negative in early cases. Nevertheless, in conjunction with other data, they are extremely useful. *Parasitological diagnosis.* Definitive diagnosis of visceral leishmaniasis should be based on the demonstration of leishmania forms in stained preparations or the growth of leptomonad forms in cultures inoculated with suspected blood or tissue. Tissue, not blood, is desired for examination. The syringe used for aspiration should be dry. Possible sources of specimens in which organisms might be found include the spleen, liver, sternal bone marrow, lymph nodes, and skin lesions. Liver puncture is not recommended. Spleen puncture is the most reliable approach. It is not free from danger and should never be attempted without careful study of the technique, which is described in detail in the original TB MED. *Smears.* Tissue puncture material should be spread as thin as possible, allowed to dry, and, after staining with Giemsa or Wright's stain, should be examined under an oil immersion lens. *Cultures.* When parasites cannot be found by direct microscopic examination of tissue smears, they may be demonstrable in cultures of the tissue material. Cultures cannot be relied

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

on to establish a diagnosis promptly but should be employed routinely whenever possible. (See TB MED 183 and TM 8-227.)

Treatment. Patients with fever, severe anemia, or leukopenia should be kept in bed. A well-balanced and liberal diet should be given. Special attention should be paid to the care of the mouth. If severe anemia, leukopenia, or bleeding tendency exists, transfusions of blood should be given. In cases with secondary infection or cancrum oris, the use of penicillin is advised. Splenectomy should never be performed for the treatment of this disease. *Chemotherapy.* The early institution of chemotherapy for kala-azar is highly desirable. There are few contraindications for such treatment, except serious disease of the lungs, heart, liver (aside from disease due to leishmaniasis), and kidneys. At present, neostibosan is considered the drug of choice for general use. Antimony and potassium tartrate is not recommended. Fuadin should not be used. *Neostibosan.* This drug is a standard Medical Department supply item (No. 1300700). The drug should be given only when *freshly* prepared with sterile distilled water. The solution should not be boiled or heated, and it should be used as soon as possible. Neostibosan is administered intravenously in 5 percent solution. For adults, the first dose is 0.2 gm. and subsequent doses are 0.3 gm. The total dose is 3.8 to 5.0 gm. (thirteen to sixteen injections). Doses may be given daily, unless untoward effects appear. If untoward effects appear, the drug should be given on alternate days, the dosage reduced, or administration stopped, as the circumstances indicate. The most frequent toxic effects are nausea and vomiting. In rare instances, increased fever, dizziness, urticaria, abdominal and muscular pain, renal irritation, and increased bleeding may appear. *Results of treatment.* The response to treatment is usually slow. The return of the white blood cell count to normal is an important criterion of progress. If parasites are demonstrated in the fourth week after completion of treatment, or signs or symptoms persist, another course should be given. Larger doses and a longer course may be necessary.

Prevention. Measures which may be taken to prevent infection include chiefly the segregation of troops at a safe distance from infected native populations, the control of sandfly vectors, and individual protection from the bites of sandflies. Many measures used in malaria control also afford protection against kala-azar. Camp sites should be located on open, elevated, dry, sandy ground when feasible, and as far from native dwellings and domestic animals as possible. The more breeze in a given location, the better. Ordinary screening and standard mosquito bed nets do not exclude sandflies. Occupants of buildings may be effectively protected, however, by the application of DDT residual spray to the entire inner walls, ceilings, and fixtures, and to the inside and outside of screens and doors, including a foot or two of the outer wall around their casements. Additional protection may be secured by spraying twice daily with an aerosol dispenser or other available insecticide. Whenever possible the area within a radius of 50 to 100 yards of camp sites and quarters should be cleared of rubble, detritus, gardens, vegetation, and needless earthen walls or banks, which may serve as breeding places or shelters for sandflies. When clearing is impracticable, the area should be sprayed with DDT solution at the rate of 2 to 4 pounds of DDT per acre. When troop concentrations are necessarily in proximity to infected native populations, spraying of their dwellings with DDT residual spray is advisable. Sleeping nets of mesh fine enough (more than 45 per inch) to keep out sandflies should be used in heavily infested areas if other effective measures for protection are not feasible. After sundown, long-sleeved shirts and full-length trousers should be worn, and insect repellent should be used on exposed parts of the body. Protection against bites of sandflies lasts for four to six hours.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

DERMATOLOGICAL PROBLEMS IN TROPICAL THEATERS

This article briefly outlines the salient features of experience accumulated during this war, and does not discuss the exotic tropical dermatoses, such as yaws and tinea imbricata, which have been infrequent in American soldiers. The following dermatological conditions have been outstanding: (1) Eczematoid dermatitis with secondary pyogenic infection characterized by symmetrical, oozing, eczematous, violaceous-tinged plaques which have a predilection for the dorsal surface of the hands, feet, arms, and legs. Other parts of the body especially the neck and thighs may be involved, and sometimes the eruption becomes generalized. (2) The atypical lichen planus syndrome characterized by a combination of eczematous plaques and hypertrophic, violaceous, lichenoid lesions. Distribution is generalized with a predilection for the feet, hands, legs, forearms, and face. (3) Bullous impetigo characterized by flaccid thin-walled vesicles or bullae filled with purulent exudate. (4) Ulcerative pyogenic lesions (ecthyma) usually secondary to insect bites and other forms of minor trauma. (5) Superficial fungus infections including tinea versicolor and relatively common and extensive. (6) Contact dermatitis due to the sap of various trees is an important cause of disability in many parts of the tropics. Ordinary "poison ivy" is not found in tropical theaters. (7) Cutaneous diphtheria. An extremely important disease which may be very common in endemic areas, especially in *combat soldiers*. (8) Miliaria. The incidence of this disease varies directly with the degree of heat and humidity. (9) Furunculosis, sycosis vulgaris, folliculo-pustular eruptions, and all other pyogenic dermatoses are relatively common, chronic, and resistant to treatment. (10) *Acne vulgaris*, seborrhoeic dermatitis, psoriasis, atopic dermatitis, and *all forms of localized eczema* tend to become worse in hot humid climates.

The following general principles of dermatological diagnosis and treatment are particularly important in the tropics:

1. Overtreatment with irritating and sensitizing drugs causes more disability than the primary diseases. In particular, tincture of iodine, Frazer's solution, *sulfonamide ointments*, strong salicylic acid preparations, and Whitfield's ointment are likely to be misused, especially in ambulatory dispensary patients. *Any* medication which causes even a questionable exacerbation should be discontinued immediately. The following drugs, in addition to those enumerated in paragraph 2 below, are useful preparations and are usually nonirritating: Fungicidal ointment (Med. Dept. Item No. 1322050), Castellani's carbofuchsin paint which may be diluted with one part of water, for fungus infections of the feet, groin, and body; Tar compound ointment (Item No. 1470300) for chronic fungus infections, especially tinea cruris and tinea corporis, seborrhoeic dermatitis, pityriasis rosea, and psoriasis; an antipruritic lotion (menthol 0.5 gm., camphor 0.5 to 1.0 gm., talc and zinc oxide ãã 20 gm., glycerin 15 cc., and 95 percent alcohol and water ãã 35 cc.) and 1:30 Burow's solution soaks (Item No. 1108400) for acute pruritic dermatitis; either antipruritic lotion or sulfur and resorcin lotion (resorcinol 2.0 gm. sulfur ppt. 5.0 gm., zinc oxide and talc ãã 20.0 gm., glycerin 10.0 cc., water and 95 percent alcohol ãã 35.0 cc. for miliaria.

2. The pyogenic dermatoses (impetigo, ecthyma, impetiginized eczema, etc.) are important causes of prolonged disability especially if they are neglected and become well established. Treatment measures in forward areas include 1:9,000 potassium permanganate soaks, 1:1,000 silver nitrate soaks, 2 to 3 percent ammoniated mercury ointment, and 2 percent gentian violet in 10 percent alcohol. Sulfonamide ointments should *not* be used for reasons which cannot be explained in this brief discussion. Preliminary observations indicate that the local use of penicillin is of

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

particular value in primary pyogenic dermatoses—such as, impetigo, *ecthyma*, and secondarily infected contact dermatitis. In some cases of secondarily infected eczematoid dermatitis and atypical lichen planus, parenteral administration of penicillin results in spectacular improvement. Locally it may be used in the form of a compress or incorporated in an ointment vehicle (Emulsion base, Med. Dept. Item No. 1173800, is satisfactory) with about 500 units per gram of base. If the lesions are extensive, it is preferable to use the drug parenterally. Penicillin may cause sensitization reactions, particularly in eczematoid pyodermia.

3. Patients with eczematoid lesions particularly on hands, feet, and groin cannot be treated on an ambulatory basis. Sulfonamide ointments, Frazer's solution, tincture of iodine, salicylic acid ointment, and other irritating therapeutic agents should *never* be used. Most of these cases require hospitalization.

4. Therapeutic agents, such as sulfonamides, arsenicals, atabrine, and quinine, should be withheld or administered with caution to patients with skin diseases which might be caused by drug sensitization.

5. So far as possible, ulcerative lesions should be considered on an etiological basis. It must be remembered that usually cutaneous diphtheria is an ulcerative lesion and that this disease is not uncommon in the tropics. The practice of grouping together ulcerative lesions under the term "tropical ulcer" is to be deprecated.

6. Heavy ointments and pastes, occlusive dressings, and preparations containing more than 3 percent salicylic acid are not well tolerated in the tropics.

7. The etiological role of fungi should not be overemphasized, because it leads to failure to consider other etiological factors, such as the pyogen, the contact, the psychosomatic, and the endogenous drug and food allergen.

DENGUE

Dengue is an acute infectious disease caused by a filtrable virus and transmitted to man by species of *Aedes* mosquitoes. The disease is endemic in tropical and subtropical regions and widespread epidemics may occur.

Clinical features. After an incubation period of four to fifteen days, a sudden onset occurs with fever, malaise, intense headache, and pains in the back and extremities. A deep soreness behind the eyes and pain on motion of the eyes are frequently present. Prostration and mental depression may be extreme. There is frequently a blotchy congestion of the face. After three or four days, a stage of remission may or may not occur, with a fall of temperature to normal and a subsidence of symptoms, but followed by a second febrile period lasting two or three days. The secondary fever usually appears on the sixth or seventh day of the disease and there is a return of symptoms. In characteristic cases a rash appears during this stage of the disease. It usually appears first on the extremities, later involving the face and trunk. The rash resembles that of measles but may be punctiform and resemble scarlet fever. Desquamation may occur. Many cases of dengue do not develop a rash. It is probable that many of the short-term fevers occurring in tropical regions and without characteristic clinical features represent atypical cases of dengue.

Laboratory findings. As early as the second day of the disease the white blood cell count begins to fall and by the fifth or sixth day leukopenia may be marked. There is a relative lymphocytosis and a shift to the left of the neutrophils. The blood picture returns to normal during early convalescence. There is no specific laboratory test.

Diagnosis. The diagnosis of dengue is made on clinical and epidemiological evidence supported by the laboratory findings. The differential diag-

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

nosis includes sandfly fever, malaria, and influenza.

Treatment. There is no specific therapeutic agent, and treatment is entirely symptomatic. The mortality rate is extremely low. Convalescence may be prolonged.

Prevention. Prevention of dengue depends primarily on control of the vectors and on individual protection from the bites of mosquitoes. Since the principal mosquito vector, *Aedes aegypti*, commonly breeds in artificial containers, thorough policing should be made of troop areas to remove containers and objects of any type which may hold water. Cisterns should be larvicided and screened or covered. Measures should also be directed against adult mosquitoes, such as applying DDT residual spray to quarters and adjacent civilian habitations, screening of working and sleeping quarters, removing vegetation around camp sites when the situation permits, and area spraying and barrier treatment with DDT when indicated (TB MED 110). Area spraying of DDT by aircraft, to kill infected adult mosquitoes, is particularly valuable during outbreaks. Personal protective measures which should be employed include the application of insect repellent during the day and evening, wearing of full-length clothing, use of mosquito bars, and routine spraying of quarters with the aerosol "bomb" or other insecticide during the day and evening.

RELAPSING FEVER

Relapsing fever, an infectious disease caused by various strains of spirochetes and transmitted to man by "soft-shelled" (argasid) ticks and the body louse, has a widespread distribution throughout the world. In general, louse-borne infections result in the most serious epidemics of the disease. In tick-borne relapsing fever there may be rodent reservoirs of the disease.

Clinical features. The incubation period is three to ten days. There is a sudden onset of fever, malaise, generalized aches, and headache. The temperature rises rapidly to 104° to 105° F. and is sustained for three to four days, following which it falls by crisis. After an afebrile period of four to eight days there may be a second acute febrile episode. If the patient is not treated, he may have a series of relapses. Enlargement of the spleen is frequently present. Enlargement of the liver and jaundice may occur. Albuminuria is usually observed.

Diagnosis. The disease most likely to be confused with relapsing fever is malaria. Other diseases to be considered in the differential diagnosis are yellow fever, typhus, and Weil's disease. During the febrile period, spirochetes usually can be demonstrated in the blood by the darkfield technique or in dried films stained by Giemsa's stain. If spirochetes are not numerous, thick blood films may be helpful.

Treatment. Early in the course of a febrile episode, treatment usually effects a termination of the attack. Treatment just before a natural crisis is undesirable, since dangerous collapse is sometimes precipitated. One dose, or at a forty-eight-hour interval two doses, of mapharsen 0.045 gm. given intravenously constitutes the usual treatment. Penicillin is effective in experimental relapsing fever and has been used with good results in a small number of clinical cases.

Prevention. Prevention consists mainly in avoidance of contact with individuals harboring lice and places infested with argasid ticks, particularly caves and animal nests and burrows. Insect repellent applied liberally to skin and clothing provides partial protection against ticks. Individuals should be kept free from lice by use of DDT louse powder, especially in the presence of epidemics of the disease.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

PREVENTION AND TREATMENT OF ADVERSE EFFECTS OF HEAT

Factors which influence the ability of troops to work efficiently in hot climates. General. The factors which determine the ability of troops to work efficiently in hot climates are: the environment, the degree of acclimatization, the water and salt intake, the type of clothing worn, and the type and rate of work. A change in any of these factors will have a direct influence on the efficiency of the troops. *Environment.* The effect of the environment will vary with the temperature, humidity, air movement, and radiant heat. Because the wet-bulb temperature is dependent on the evaporative cooling ability of the air, it is a better index of the effect of a given environment on man than is the dry-bulb temperature. Air movement cools the body when the temperature is below 95° F., while in a temperature above 100° F. moving air carries heat to the body faster than still air. *Acclimatization.* Troops suddenly exposed to high temperatures must pass through a period of acclimatization before they are able to carry out efficiently duties involving physical exertion. This period of acclimatization is required regardless of the individual's physical condition. When work is begun with first exposure to the heat and progressively increased *within the limits of tolerance of the man*, full acclimatization is attained most quickly. Acclimatization is fairly well established by the end of the fourth day. The importance of an adequate amount of sleep daily cannot be overemphasized. A schedule, with alternating rest and work periods, which provides for work during the cooler morning and afternoon hours, should be set up (see original TB MED). *Water requirements.* At air temperatures in excess of about 95° F., the only means by which the body is cooled is through the evaporation of water from the skin and lungs. Any restriction of water below levels necessary for the man will result in rapid loss of efficiency. *Salt requirements.* In all circumstances, the loss of water through sweat is associated with a loss of salt. The amount of salt taken in the normal diet is adequate to make up salt loss when the total water intake is under one gallon per day. Above these levels, added salt is needed. It is best taken in solution. This is best done by making a solution of 0.1 percent table salt in the drinking water. Water containing approximately this amount of salt can be made as follows: (1) 1 pound table salt to 100 gallons of water; (2) 0.3 of a pound table salt to the Lyster bag (36 gallons); (3) ¼ teaspoonful table salt to each canteen of water; (4) two 10-grain salt tablets dissolved in every quart of water consumed. *Direct ingestion of salt tablets is not recommended* because salt taken in concentrated form is not readily absorbed and hence may cause nausea and vomiting.

Adverse effects of heat. Under conditions of exposure to high environmental heat and humidity, adverse effects of heat may occur in the exposed individual. Three fairly distinct clinical syndromes may occur, depending on the manner of breakdown of the individual's heat adjustment. These syndromes are heat exhaustion, heat cramps, and heat stroke. *Heat exhaustion.* Heat exhaustion occurs as the result of excessive loss from the body of water and salt. Clinically, there are headache, mental confusion, vertigo, incoordination, drowsiness, extreme weakness, and visual disturbances. Occasionally cramps of the extremities or abdominal muscles occur. Consciousness is rarely lost. The mouth temperature may be subnormal or slightly elevated, but the rectal temperature is usually elevated (99° to 101° F.). *The skin is usually cool and there is profuse perspiration.* The pulse rate is rapid (140 to 200 per minute), and the blood pressure may be lowered. Any factor that promotes the return of blood to the heart will tend to relieve this condition. The individual should be removed to a cool place

Abstract of TB MED 175, June 1945

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

where he may rest. The deficit of water and salt should be made up by the administration of large quantities of salt solution. Saline solution (0.1 percent) should be given by mouth as freely as the patient will take it. If water is not available, salt tablets or salt in other forms should not be administered alone. In the presence of severe collapse, physiologic saline solution (2,000 cc.) should be administered intravenously. *Heat cramps.* Painful cramps of the voluntary muscles may occur following exposure to heat. Heat cramps result primarily from excessive loss of salt from the body. Heat cramps are promptly relieved by replacing the salt lost from the body. Saline solution (0.1 percent) by mouth or intravenous physiologic saline solution should be administered. *Heat stroke.* Heat stroke is a very serious condition with a high mortality rate. It is characterized by extremely high body temperature, usually with profound coma. The development of heat stroke represents a breakdown of the body's heat regulating mechanism, and it is particularly prone to occur in individuals who are not acclimatized to heat. In the great majority of cases there is absence of sweating, indicating that failure of the sweating mechanism is responsible for the high body temperature. All military personnel should be taught the importance of the recognition of cessation of sweating and the initiation of corrective measures at the stage when the condition is reversible. There may be premonitory symptoms of headache, dizziness, weakness, nausea, or diminished or absent sweating. Usually, however, the onset of heat stroke occurs with dramatic suddenness and there is collapse and loss of consciousness. Profound coma is usually present and convulsions may occur. The body temperature is markedly elevated (106° to 110° F.). *The patient's skin is usually hot, red, and dry, and there is absence of sweating.* In the early stages of heat stroke the pulse is full and rapid and the blood pressure is normal or elevated. Respirations are rapid and deep and may simulate Kussmaul breathing. Pulmonary edema may occur. As the patient's condition become progressively worse, the pulse rate rises, the blood pressure falls, and the breathing becomes shallow and irregular. Death may occur very rapidly, but, if the patient survives until the second day, recovery usually occurs. Rectal temperatures of 102° to 103° F. may persist for several days, and mental disturbances, excitement, and delirium may continue or recur. In the first few days after the temperature has been reduced from a critical level, severe relapses may occur. The patient should, therefore, be observed carefully during this period, and the rectal temperature should be recorded frequently. The heat-regulating centers may be extremely labile for many weeks after an attack. *The lowering of the patient's body temperature as rapidly as possible is the most important objective in the treatment of heat stroke.* The longer hyperpyrexia continues, the greater is the threat to life. Measures to lower the individual's body temperature should be initiated at the earliest possible moment. In the field, the patient's clothes should be removed. If there is any source of cool water nearby, the patient should be immersed in water; otherwise water should be sprinkled over the patient and its evaporation hastened by fanning. The attendants should rub the patient's extremities and trunk briskly to increase circulation to the skin. The patient should be removed to a hospital immediately and cooling measures continued during transportation. When the patient reaches the hospital, further cooling measures should be carried out immediately. If ice is available, the immersion of the patient in ice water is regarded as the treatment method of choice. Any water which is cool to the hand should be used for this purpose in preference to methods of cooling by evaporation. Continuous massage of the patient's extremities should be carried out to accomplish the dual purpose of stimulating circulation to the skin and stirring the water. If cool water is not available, the patient should be sprinkled with water

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

and fanned to hasten its evaporation. *It is undesirable and dangerous to lower the patient's temperature initially below 102° F. (rectal)*, since if this is done there may be a rapid fall of body temperature to critical levels. Rectal temperature should, therefore, be checked every ten minutes during this phase of treatment. If the rectal temperature falls below 94° F., the patient should be warmed cautiously until his temperature is restored to normal. Sedative drugs act to disturb the heat-regulating center and should be avoided as much as possible. When a sedative drug is necessary, a short-acting barbiturate, such as sodium pentothal intravenously, is the drug of choice. Sodium amytal and morphine are contraindicated. Atropine or other drugs which may interfere with sweating are contraindicated. Parenteral administration of physiologic saline solution, in moderate amounts, (1,000 to 1,500 cc.) is indicated. Care should be taken in the administration of parenteral fluids if there are signs of pulmonary congestion. Plasma should be administered if there is evidence of shock. Care should be taken in the administration of plasma if there is evidence of pulmonary congestion. Oxygen should be administered by face mask if cyanosis or pulmonary congestion is present.

PENICILLIN

The clinical use of penicillin, including methods of preparation and administration, is described in TB MED 9. The following comments are intended as a supplement to this bulletin.

Absorption and excretion. When penicillin is injected intramuscularly, absorption is rapid and maximal concentrations are present in the blood within fifteen to twenty minutes. It is therefore usually unnecessary to begin penicillin therapy with an intravenous injection. Almost all of the injected penicillin is excreted in the urine. After four hours the amount left in the body represents only about 5 percent of the original dose. Repeated injections are necessary to maintain effective blood levels. In general, diffusion of penicillin into various body fluids and cavities occurs irregularly and to a small extent. Local therapy, as well as parenteral injections, has been used in the treatment of infections of the pleural, pericardial, and joint cavities. Penicillin does not diffuse into the cerebrospinal fluid under normal conditions. In cases of irritation or infection of the meninges, variable amounts of penicillin may appear in the cerebrospinal fluid. However, for adequate treatment of cases of bacterial meningitis both intramuscular and intrathecal injections of penicillin should be given. In certain conditions, notably subacute bacterial endocarditis and chronic osteomyelitis, the factor of penetration of penicillin into the lesion must be considered. Favorable results in the treatment of subacute bacterial endocarditis have been reported with the use of very large doses of penicillin which presumably result in the penetration of vegetations and destruction of organisms. The failure of penicillin to appear in the sputum of patients with pneumonia may be of importance in infections of the respiratory tract. Although penicillin may destroy some organisms present in the parenchyma of the lung, a reactivation of the infection may be caused by pneumococci remaining viable in the bronchial exudate if treatment is discontinued too soon. If penicillin is used to treat severe cases of bacterial pneumonia, it is advisable to continue treatment for at least six days to prevent relapses.

Dosage. Experimental determinations of the relationship of antibacterial activity to blood levels of penicillin have demonstrated that different levels of penicillin are required for the treatment of different infectious diseases. For example, in staphylococcic infections, injections of 25,000 units every two hours produce optimal continuous levels in the blood stream,

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

while for streptococcic infections 15,000 units every three hours are adequate. While no attempt is made in this discussion to make specific recommendation of dosage for various infections, it should be emphasized that the attainment of adequate blood levels and their maintenance are all-important in therapy. For all practical purposes penicillin remains in the blood stream for only three to four hours following usual therapeutic doses. In the treatment of serious infections, injections must be continued at regular intervals night and day.

Penicillin resistance. Laboratory evidence indicates that resistance to penicillin of most susceptible organisms occurs only after prolonged exposure to penicillin. Clinically, with the exception of the *Staphylococcus*, well-substantiated instances of penicillin resistance have not been described. Penicillin resistance has been observed in about 10 percent of strains of staphylococci isolated from clinical sources. Available evidence suggests that resistance is much less likely to occur if the organisms are, from the start, kept in contact with high concentrations of penicillin.

Slowly absorbed preparations. Oral penicillin. Efforts have been made to delay the absorption of penicillin by mixing it with beeswax and peanut oil, by the use of vasoconstrictors, and by the application of cold compresses near the site of injection. Attempts are also being made to delay excretion by combining penicillin with substances of high molecular weight, and by the concomitant administration of other agents which complete with penicillin for excretion by the renal tubules. The most promising of these methods is the intramuscular injection of penicillin-beeswax-peanut oil mixtures. Methods of administering penicillin by mouth are also being studied. None of the enteric coatings, oils, or antacids so far employed have been entirely satisfactory.

Sensitivity reactions. With the greatly increased use of penicillin, more sensitivity reactions are being reported. The majority of these have been cases of urticaria or of contact dermatitis following the local application of penicillin. Cases which clinically resemble serum sickness, and syncopal collapse during injection have also been observed. It is not yet clear whether these reactions are due to impurities in commercial penicillin or to penicillin itself. In at least one case sensitivity to crystalline penicillin has been demonstrated. Care should be taken in the reinjection of penicillin in individuals who have had such reactions.

Laboratory Methods

Determination of susceptibility of bacteria to penicillin.[1] No single method of determination of penicillin susceptibility has been standardized or widely used. The following simple method is offered as one which will provide a sufficiently accurate estimation for clinical use.

1. Materials and reagents. (a) Standard penicillin solution. A known solution of penicillin is diluted with 0.85 percent sodium chloride solution to a final concentration of 50 units per cc. Store in the refrigerator. (b) Filter paper. Accurately cut strips into a uniform size (½ by 3¼ inches) that can be readily applied to the surface of a Petri dish culture plate. Autoclave the strips and store in a Petri dish. After sterilization the strips should be handled with forceps which are flamed each time before use. (c) Media. Blood agar or brain-heart infusion agar prepared in a uniform manner from similar ingredients is employed. The depth of the agar should be the same from plate to plate. Agar plates which have been stored for more than seven days are not to be used.

2. Procedure. Using parallel strokes, inoculate the plated medium with material from a pure culture of the organism to be tested. The strokes should be about 4 mm. apart to ensure good isolation and an adequate but

1. After McDaniels, H. E., McCloskey General Hospital, unpublished manuscript.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

not over-abundant growth. Several organisms can be tested on a single plate. Saturate a strip of the sterile filter paper in the standard penicillin solution. When all excess solution has drained from the strip, it is placed across the streakings in the center of the plate. Following inoculation, the plate is inverted and incubated for eighteen to twenty-four hours.

3. Results. The width of the zone of inhibition immediately adjacent to the edges of the filter strip is measured with a millimeter rule. An arbitrary scale for reporting sensitivity is as follows:

Width of zone	*Report*
Less than 2 mm.	Not sensitive
2 to 4 mm.	Slightly sensitive
5 to 8 mm.	Moderately sensitive
9 to 14 mm.	Sensitive
15 mm. and over	Very sensitive

Determination of penicillin in body fluids and exudates.[2] 1. Materials and reagents. (a) Standard penicillin solution. Dilute a solution of penicillin with 0.85 percent sodium chloride to a final concentration of 20 units per cubic centimeter. Keep in the refrigerator. (b) Plain broth. (c) Specimens. Withdraw samples of venous blood and allow it to clot in a sterile tube. Separate the serum and store it at 5° C. until the time of testing. Keep other specimens at the same temperature. If specimens are known to be contaminated sterilize by filtration through a Seitz filter.

2. Procedure. Make serial dilutions of 0.2 cc. of serum or other sample with 0.2 cc. of plain broth. Set up a series of three to fourteen dilutions in sterile serologic tubes. Set up a similar series of dilutions of the standard penicillin solution. Add to each tube in both series 0.5 cc. of plain broth containing 1 percent of red blood cells and from 1,000 to 10,000 group A hemolytic streptococci. Incubate for eighteen to twenty-four hours and then examine for growth.

3. Results. In general, cultures showing no hemolysis are sterile, but this should be checked by streaking several dilutions on either side of the apparent end point on blood agar plates. The concentration of penicillin in 0.2 cc. of the unknown is determined by comparison with the standard control.

Penicillin inhibitors. In patients under penicillin treatment, specimens of blood, urine, and material from wounds, sinuses, and body cavities may contain significant amounts of the drug. There is danger of sufficient penicillin being carried over in the inoculum to inhibit growth of small numbers of organisms. Penicillin inhibitor (penicillinase or clarase) should accordingly be added to the isolation media.

CLINICAL FEATURES OF ACUTE INFECTIOUS HEPATITIS

Acute infectious hepatitis is caused by a filtrable virus which produces inflammatory and degenerative lesions in the liver and is manifested clinically by symptoms referable chiefly to the liver and the alimentary tract. The onset may be similar to that of other acute infections. The subsequent course, however, manifests very few of the clinical features of infection but gives evidence of important physiologic disturbances which are at present poorly understood. The course may be divided into three phases: the initial phase without icterus; the phase of icterus; and the convalescent phase. In a small number of cases the first sign of the disease may be jaundice. In most cases, however, the onset is sudden with symptoms of acute infection and gastrointestinal tract disturbance. The most common symptoms are anorexia, nausea, vomiting, fatigue, fever, and upper abdominal pain accen-

2. Rammelkamp, Charles H., Commission on Acute Respiratory Diseases of the Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the Army, unpublished manuscript.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

tuated by jarring movements. This stage averages one week in duration and is usually followed by the appearance of jaundice. The jaundice may be slight and transient or it may be intense and last for many months. The average duration is three weeks. During this period the liver is usually enlarged and tender. As convalescence begins, the jaundice fades, and the liver returns to normal size. The appetite improves, and strength increases. During convalescence there is always danger that a relapse may occur if the patient is allowed to resume activity too soon. Carefully supervised periods of graded exercise should be used as a test to determine whether or not a patient is ready for duty. If activity is allowed before convalescence is complete, the liver again becomes enlarged and tender, and if activity is allowed to continue all the symptoms of the acute attack may return. The convalescent period should never be shorter than two weeks, and following serious attacks it may last months. The average duration is four weeks. A small number of cases in epidemics of acute infectious hepatitis have been reported in which the course of the disease is typical except that jaundice fails to appear. Diagnosis is difficult and may depend only on slight tenderness and enlargement of the liver, and transient bilirubinuria. This type of the disease is usually mild, but recognition is important, since if the patient is not properly treated the attack may become more serious. In severe attacks, death may occur as early as thirty-six hours after onset.

Physical examination. The liver is usually enlarged and tender, and the spleen is palpable in 30 percent of cases. Jaundice is apparent. There is frequently enlargement of the lymph nodes. In severe attacks there may be ascites, peripheral edema, hemorrhages, and spider hemangiomata.

Laboratory examinations. There is usually slight leukocytosis in the early stage, with lymphocytosis. Bile pigments can be detected in the urine. The thymol turbidity test and the bromsulfalein excretion test may give valuable information. The Hanger test is useful. The prothrombin time may be prolonged.

Differential diagnosis. In the acute phase, respiratory tract infections, nonspecific or specific gastrointestinal tract infections, malaria, dengue, sandfly fever, or influenza may be suspected. When jaundice appears, gallbladder disease, yellow fever, Weil's disease, or drug intoxication must be considered in the differential diagnosis.

Treatment. Bed rest and the maintenance of adequate nutrition are the most important aspects of treatment. There is good evidence to show that reduction of fat intake is not so essential as is a well-rounded diet administered in frequent small feedings. When necessary, fluids including plasma and amino acids may be administered by vein. Parenteral vitamin K should be given when the prothrombin time is prolonged.

Prognosis. When the diagnosis is made early and immediate bed rest is rigidly enforced, the prognosis is excellent. However, if the disease remains undiagnosed or if, once diagnosed, the patient is allowed to remain active or to return to activity too soon, the consequences may be serious. Approximately 0.4 percent of patients with acute infectious hepatitis die.

POLIOMYELITIS

Poliomyelitis is an acute infectious disease caused by a neurotropic virus and in clinically characteristic cases is manifested by flaccid muscular paralysis without sensory loss. The manner in which the virus of poliomyelitis is spread throughout the population is unknown. The manner in which the virus enters the human body is also still a matter of conjecture, but it is likely that the alimentary tract is the principal portal of entry. Regardless of how the virus enters the body, one of its major portals of

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

exit is the alimentary tract. The incubation period is commonly about ten days.

Clinical features. Clinical forms of poliomyelitis are: abortive, paralytic, bulbar, and encephalitic. The onset in abortive and paralytic types alike is sudden, with fever, malaise, headache, abdominal discomfort, and sometimes mild sore throat. Constipation frequently occurs. The febrile illness commonly continues for from three to five days. Drowsiness, irritability, apprehensiveness and insomia, severe headache, or slight stiffness of the neck may suggest diffuse irritation of the central nervous system. In abortive attacks these symptoms subside, leaving the diagnosis either unsuspected or at least unproved. If paralysis occurs, it usually become evident during the second twenty-four hours of fever but it may not appear for several days.

Diagnosis. For effective treatment and epidemiological control early diagnosis is of great importance. *Differential diagnosis.* Poliomyelitis deserves first consideration whenever flaccid paralysis is found associated with fever and without loss of sensory function. In cases of peripheral neuritis, differentiation from poliomyelitis is aided by the presence of sensory loss. In paralyses due to diphtheria and in cases of the Guillain-Barré syndrome, the presence of sensory disturbance is also an important differential point and the muscle paralyses are in the area of distribution of a peripheral nerve. In cases of poliomyelitis where involvement of the meninges or brain is evident clinically, the differential diagnosis should include meningitis and encephalitis of other etiology. In spinal epidural abscess there is localized pain over two or three vertebrae and signs of intervertebral block. *Diagnosis of paralysis of muscles of respiration.* This is of great importance if proper use is to be made of a mechanical respirator. Wakefulness, restlessness, and anxiety are early signs, while an increased rate of breathing and disinclination to talk may indicate a serious degree of paralysis. None of these signs specifically indicates the presence of paralysis of the respiratory muscles, but they require careful evaluation. Cyanosis from respiratory muscle weakness and the strained use of accessory muscles are late signs and should not be allowed to occur. Response to trial in the respirator has definite diagnostic value in doubtful cases. *Diagnosis of bulbar poliomyelitis.* Involvement of the medullary centers is characterized by paralysis of the palate and muscles of deglutition and by shallow and irregular respirations. If the patient's own respiratory efforts are unsuccessful in ventilating the lungs, the respirator may be given a therapeutic trial. For the most part, however, such patients are little helped by the apparatus. *Laboratory findings.* Leukocystosis is usually present during the acute stage. The cerebrospinal fluid is under normal or slightly increased pressure. There is a mild or moderate pleocytosis. Granulocytes are found early in the course of the disease, but later lymphocytes predominate. The protein content is normal or slightly elevated but may increase during convalescence, as the cell count falls.

Treatment. There is no specific treatment. *Acute phase.* As a rule, patients should be treated during this phase in the hospital where they are first seen. If special equipment is necessary, it should be transported to the patient. Absolute bed rest is essential. The affected extremities should be placed in a neutral rest position, since paralyzed muscles are susceptible to permanent injury by stretching. Application of heat, preferably by hot, moist packs, to the involved muscle groups is desirable for the relief of pain and tenderness. In the absence of pain and tenderness, the patient should be allowed to rest without the disturbance of physical therapy procedures. Patients with paralysis of the respiratory muscles should be placed in a respirator. If there is bulbar paralysis, nursing care is extremely impor-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

tant. The foot of the bed should be elevated to facilitate drainage from the throat and suction equipment should always be at the bedside. It is unwise to give anything to the patient by mouth; intravenous feeding or gavage should be employed. *Subacute phase.* Treatment of this phase, in addition to the measures listed above, is directed to the protection of affected muscles and the institution of limited movements. Rigid fixation of paralyzed or weakened extremities in splints should be discouraged because of the possibility of contractures. During this period passive movements within the limit of pain tolerance should be instituted by qualified physiotherapists under the direction of medical officers. *Convalescent phase.* Orthopedic and physical therapy measures should be adopted which will ensure maximal recovery of muscle power.

Methods of control. Early recognition, isolation, and reporting of cases are important. Patients in whom the diagnosis of poliomyelitis is made, including cases which are thought to represent abortive cases, should be hospitalized and isolated. Bowel discharges and articles soiled therewith should be disinfected. Screening against flies should be carried out. Tonsillectomy operations should be postponed during epidemics of the disease.

TREATMENT OF INFECTIOUS DISEASES WITH SULFONAMIDE DRUGS

Routes of administration and dosage. Oral route. The oral route should always be employed if possible. Adequate doses of the selected sulfonamide should be given to ensure an effective blood level and the maintenance of this level. The recommended initial oral dose of the well-absorbed sulfonamides is 4 gm. for an adult and the maintenance dose is 1 gm. every four hours. The recommended initial dose of sulfaguanidine and sulfasuxidine is 6 gm. and the maintenance dose 3 gm. every four hours. It should be remembered that absorption of the latter two compounds may be marked in the presence of extensive inflammation of the intestinal tract. The degree of absorption of these compounds should be checked by blood levels. *Parenteral administration.* Parenteral therapy is indicated as an initial dose in severely ill patients and in patients unable to take the drug by mouth. Repeated parenteral injection should be avoided, if possible, because of the increased danger of renal complications. Five percent solutions of the soluble sodium salts of sulfathiazole, sulfapyridine, or sulfadiazine should be prepared, using sterile precautions. The solutions should not be boiled. Since these solutions are strongly alkaline, they must be injected intravenously with care to avoid their extravasation. The recommended initial intravenous dose is 5 gm. and the maintenance dose 1 gm. every six hours. Sodium sulfadiazine is preferable for intravenous injection because of its slower rate of excretion. Oral doses should be begun as soon as possible. *Local application.* The sulfonamides are relatively ineffective when applied locally, particularly in areas of tissue necrosis or purulent exudate where their action is counteracted by the presence of sulfonamide antagonists. Their local use in wounds, other than those of the serous cavities, is no longer permissible (see W.D. Circular No. 160, 1945). Penicillin is the chemotherapeutic agent of first choice for local use in purulent infections of the serous cavities. The local use of the sulfonamides in the treatment of chronic skin infections is not recommended because of the frequency of sensitization when they are used in this manner.

Fluid balance—adjuvant alkali therapy. The fluid output must be followed carefully in patients receiving chemotherapy with the sulfonamides because of the danger of renal obstruction from precipitated drug crystals.

Abstract of TB MED 172, June 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

When the urinary output is 1,500 cc. or more daily, there is little danger of this complication. Intravenous or subcutaneous fluids should be used if necessary to maintain an adequate output of urine. If this cannot be achieved, alkalinization of the urine is recommended. In the average individual an initial dose of 6 gm. (90 grains) of sodium bicarbonate followed by doses of 2.6 gm. (40 grains) every four hours will produce an alkaline urine. One-sixth molar sterile sodium lactate solution may be given intravenously. One liter of this solution is equivalent in its alkalinizing effect to 14 gm. of sodium bicarbonate. Fluid administration presents special problems in the patient with anuria. Oliguria or anuria may occur during sulfonamide therapy from renal obstruction due to precipitated drug crystals and from injury to renal cells in acute hemolytic anemia and in severe sensitivity reactions. There is clinical evidence that the persistent administration of large amounts of fluid in the patient with anuria may be a dangerous procedure, producing a marked increase in blood volume and frequently leading to pulmonary edema. Fluid administration in large quantities (3,000 cc. in excess of the urine output) is recommended during the first twenty-four hours after the development of anuria or marked oliguria. If diuresis occurs, the fluid intake should be maintained at a high level. If diuresis does not occur, the subsequent fluid intake should be limited to the amount required to replace the water lost from the body. Under ordinary conditions the skin and respiratory tract together put out 750 to 1,000 cc. of water daily. In view of the tendency to pulmonary edema in these patients, caution should be observed in the use of fluids containing sodium ion.

Toxic effects. Toxic reactions from the sulfonamides fall into three groups: pharmacological toxic effects, manifestations of drug sensitivity, and mechanical effects resulting from the precipitation of drug crystals in the kidneys and urinary tract. *Pharmacological toxic effects.* These occur primarily during the administration of sulfanilamide and sulfapyridine. They are rarely of clinical significance and usually do not necessitate discontinuing the drug. They consist of nausea and vomiting; dizziness, mental confusion and incoordination; and cyanosis and acidosis. Peripheral neuritis, which probably also belongs in this group, is a rare complication of sulfonamide therapy. If it develops, the drug should be discontinued. *Sensitivity reactions.* The great majority of the serious toxic reactions occurring during the administration of sulfonamides are the result of the development of sensitivity to the drug. In general, these reactions occur after a week of chemotherapy or longer; but they may be accelerated, appearing in a few days or a few hours after the institution of treatment. These toxic reactions include drug fever, skin eruptions, conjunctivitis and scleritis, arthralgia, enlargement of the spleen and lymph nodes, agranulocytosis, thrombocytopenic purpura, hemolytic anemia, hepatitis, and nephritis. If manifestations of senitization appear, the sulfonamide should be discontinued immediately and treatment continued with penicillin. No attempt should be made to readminister sulfonamides to individuals who have had severe sensitivity reactions such as marked leukopenia, hemolytic anemia, purpura, erythema multiforme, exfoliative dermatitis, hepatitis, or nephritis. Before a sulfonamide is given to any individual, he should be questioned carefully about the previous use of these compounds and particularly concerning any toxic reactions which may have occurred. The possibility of sulfonamide sensitivity should also be considered in all acute febrile diseases in which a skin eruption is present. Extremely severe reactions have resulted from the administration of sulfonamides to individuals who were already manifesting sulfonamide sensitivity as a result of previous doses. Many of these reactions have followed the treatment wtih sulfonam-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ides of a rash misdiagnosed as rheumatic fever.

Selection of the sulfonamide drug. Table I indicates the response of infectious diseases to sulfonamides and penicillin and the treatment agent of choice. The action of all of the sulfonamides against bacteria is, in general, similar. Sulfadiazine is regarded as the sulfonamide of first choice for general use because of its effectiveness against bacteria, the low incidence of toxic reactions and infrequency of subjective discomfort during its administration, and the ease with which blood levels may be obtained. Sulfanilamide is less effective as an antibacterial agent than the other sulfonamides in most infections. It may be used in patients who have considerable impairment of renal function, since it does not cause renal obstruction from drug crystals. Sulfasuxidine and sulfaguanidine have a limited range of usefulness. They may be used in the treatment of bacillary dysentery but are not preferable to sulfadiazine. They should be used in place of the well-absorbed sulfonamides in the treatment of cholera.

TABLE I

Response of infectious diseases to treatment with penicillin and the sulfonamides

KEY: Drug of choice ++ Favorable response +
Value undetermined ± No value O

Disease	Sulfonamides	Penicillin
Infections due to beta hemolytic streptococci		
Empyema (1)*	+	++
Endocarditis (2)	±	++
Erysipelas	+	++
Mastoiditis	+	++
Meningitis (3)	+	++
Peritonitis	+	++
Pneumonia	+	++
Scarlet fever (4)	+	++
Tonsillitis (5)	+	++
Infections due to alpha hemolytic streptococci		
Endocarditis (6)	±	++
Infections due to anerobic streptococci	O	++
Gonococcic infections		
Arthritis	+	++
Endocarditis (2)	+	++
Gonorrhea (7)	+	++
Meningitis (3)	+	++
Ophthalmia	+	++
Peritonitis	+	++
Meningococcic infections		
Bacteremia	++	++
Meningitis (8)	++	++
Pneumococcic infections		
Empyema (1)	+	++
Endocarditis (2)	+	++
Mastoiditis	+	++
Meningitis (3)	+	++
Peritonitis	+	++
Pneumonia	++	++
Staphylococcic infections		
Abscesses and carbuncles	+	++
Arthritis	+	++
Endocarditis (2)	±	++
Osteomyelitis	+	++
Pneumonia	+	++
Fungous infections		
Actinomycosis (9)	+	++
Blastomycosis	O	O
Coccidioidomycosis (10)	±	O
Moniliasis	O	O
Sporotrichosis	O	O
Rickettsial diseases		
Rocky Mountain spotted fever	O	O
Tsutsugamushi disease (Scrub typhus fever) (11)	O	O
Typhus fever (10)	O	O
Virus diseases		
Atypical pneumonia (12)	O	±
Encephalitis	O	O

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Disease	Sulfonamides	Penicillin
Hepatitis, infectious	0	0
Influenza (13)	0	0
Lymphogranuloma venereum (14)	++	0
Measles (15)	0	0
Mumps	0	0
Ornithosis	0	±
Poliomyelitis	0	0
Rabies	0	0
Anthrax (10)	+	++
Chancroid (14)	++	±
Cholera (16)	+	±
Diphtheria (17)	+	++
Dysentery, bacillary (18)	++	0
Dysentery, amebic	0	0
Filariasis (19)	0	0
Gas gangrene (20)	±	++
Granuloma inguinale (14)	±	0
Infectious mononucleosis	0	0
Leprosy	0	0
Leptospirosis (2)		
(Weil's disease)	0	++
Lupus erythematosus (21)	0	0
Malaria (22)	±	0
Plague (23)	+	0
Ratbite fever		
Spirillum minus	0	++
Streptobacillus moniliformis	0	++
Relapsing fever	0	++
Rheumatic fever (24)	0	0
Rheumatoid arthritis	0	0
Schistosomiasis (25)	0	0
Syphilis (26)	0	++
Tuberculosis	0	0
Tetanus (17)	0	++
Tularemia (10)	±	0
Typhoid fever	0	0
Undulant fever (brucellosis)	±	0
Yaws	0	++

*Numbers in parentheses refer to footnotes.

Footnotes to Table I

(1) Penicillin should be injected into the pleural cavity.
(2) Requires two to three times the dose of penicillin usually given.
(3) Penicillin should be injected intrathecally.
(4) The use of penicillin and antitoxin should be reserved for the severe case of scarlet fever.
(5) The use of sulfonamides or penicillin should be reserved for the severe case of streptococcic tonsillitis.
(6) Requires 300,000 units of penicillin daily for at least twenty-one days.
(7) See TB MED 96.
(8) Sulfadiazine is still the most effective agent for the treatment of acute meningococcic meningitis. When penicillin is used, it should be administered intramuscularly as well as intrathecally. Combined therapy with penicillin and the sulfonamides is indicated in the fulminating type. Under these conditions treatment should be initiated with penicillin. Sulfadiazine should not be administered until shock and dehydration have been corrected.
(9) Potassium iodide has little effect on the course of the disease.
(10) See TB MED 45.
(11) See TB MED 31.
(12) Penicillin should be used in the severe case to control secondary bacterial infection.
(13) See TB MED 11. Penicillin should be used in the hospitalized patient during epidemics of influenza to control secondary bacterial infection.
(14) See TB MED 157.
(15) Penicillin should be used in the hospitalized patient during epidemics of measles to control secondary bacterial infection.
(16) See TB MED 138. Sulfadiazine and other well-absorbed sulfonamides should not be used because of the frequency of oliguria in patients with cholera. Sulfaguanidine, succinylsulfathiazole, or penicillin may be used.
(17) Antitoxin should also be administered.
(18) See TB MED 119.
(19) See TB MED 142.
(20) Antitoxin may also be administered.
(21) Administration of the sulfonamides has an adverse effect on the course of the disease.
(22) See TB MED 72.
(23) See TB MED 124.
(24) See TB MED 97. Administration of the sulfonamides has an adverse effect on the course of the disease.
(25) See TB MED 167.
(26) See TB MED 106.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Vol. IV
No. 3

PREVENTIVE MEDICINE

DISEASES OF MILITARY IMPORTANCE IN EASTERN AND SOUTHEASTERN ASIA

Certain territories which as yet remain in enemy hands—Japan, Formosa, Korea, parts of China, Indo-China, Thailand, and Malaya—extend over about fifty degrees of latitude, and reach from Malaya, close to the equator on the south, to Manchuria, which extends northward about to the latitude of the Aleutian Islands. A concise summary of the chief diseases of military importance in this huge area follows.

James S. Simmons, Brigadier General, U. S. Army, chief, Preventive Medicine Service, The Surgeon General's Office.

Most of these countries are heavily malarious. Even in Manchuria several areas are fairly heavily infected. One focus is situated in southern Manchuria between the Liao Ho and the Yalu River; this area includes the district of Mukden, in which there were about 10,000 cases of malaria in 1939. There are four important foci in northern Manchuria. These are (a) the area of Te-tu and Lung-chen, (b) the region of Nen-chiang (Mergen), (c) the area of Hei-ho (Aigun) on the Amur River, and (d) the lower reaches of the Sungari River near T'ung-chiang (La-ha-su-su). In Japan, malaria has not been considered a serious problem. Most of the cases in Japan occur in the southern and central part of the country. Dengue occurs in the entire area, except northern Japan and the interior of Manchuria. Filariasis occurs in the southern half of Japan, Korea, the coasts and river valleys of China, and virtually all of southeastern Asia.

Intestinal infections—bacillary and amebic dysentery, gastroenteritis, and the common diarrheas—are extremely prevalent. Cholera occurs on the Asiatic mainland but has not been reported from Japan in recent years.

Plague is well entrenched in Manchuria and northern China, and also occurs in Thailand, Indo-China, and Malaya.

Typhus is uncommon in Japan but is exceedingly important in Korea, Manchuria, and northern China. In southern China and southeast Asia typhus occurs but is probably flea-borne in large part. Scrub typhus (tsutsugamushi) is known to occur in northwestern Japan along rivers in the mountain districts and plains of Niigata, Akita, and Yamagata prefectures on Honshu. The disease also occurs in Formosa, Malaya, and Indo-China, and probably occurs in Thailand.

Schistosomiasis (*S. japonicum*) is common in certain parts of Japan, Formosa, and parts of China, chiefly the coastal provinces of Fukien and Chekiang, and along the course of the Yangtze River (especially around the

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

so-called Great Lakes). Other trematode infections, such as paragonimiasis and clonorchiasis, are also common.

The venereal diseases are extremely common throughout the entire area.

Diseases common among the civilian population include, in addition to the foregoing, tuberculosis, nutritional deficiencies, typhoid fever, smallpox, and common contagious diseases.

MALARIA CONTROL

The control of malaria is one of the most important problems encountered by U. S. Army forces in tropical and subtropical regions. As a large part of the war effort is concentrated in such territory, proper realization of the malaria problem and thorough knowledge of the principles of its control are mandatory for all forces concerned. Malaria is a communicable disease transmitted by mosquitoes belonging to the genus *Anopheles*. Control depends fundamentally on the prevention of bites by anopheline mosquitoes. Among the most important means employed to attain this end are the elimination of mosquitoes by destroying their breeding places and by killing them with insecticides, and the interposition of barriers which will prevent them from biting troops. When complete protection against mosquitoes is not possible, certain drugs such as atabrine, given regularly, are valuable to prevent immediate sickness from malaria and thus to maintain the effectiveness of troops. Antimosquito measures employed to control malaria are, in general, also applicable to the prevention of other mosquito-borne diseases such as dengue and filariasis.

The prevention of malaria is clearly designated in Army Regulations as a function of command. Commanding officers are charged with correction of hazards that threaten the health of their command. It is the function of medical officers to recommend to commanding officers the measures necessary to prevent malaria and to supervise those control measures that are undertaken. The Corps of Engineers has responsibility for sanitary measures necessary for the control of mosquitoes, including especially the filling and draining of breeding places and the screening of buildings. To assist commanders in the discharge of their responsibility for malaria control, the Army has created a special organization for malaria control in the Medical Department which consists of malaria control units and malaria survey units. These units are trained and equipped to plan, organize, and supervise large-scale mosquito control programs. Section IV, W.D. Circular No. 117, 14 April 1945, requires that each company, battery, or similar unit will form an antimalaria detail consisting of a minimum of two enlisted men, including one noncommissioned officer. Such details carry out mosquito control measures in the unit area, maintain mosquito-proofing, and continuously inspect the organization for breaches of malaria discipline.

Malaria discipline implies the full and willing cooperation of personnel of all ranks in faithfully and continuously observing personal protective measures, which include the wearing of protective clothing, the use of bed nets and repellent, and the taking of suppressive drugs when ordered. Except when in bed and suitably protected by a bed net, individuals must wear long trousers and long-sleeved shirts buttoned to the neck with sleeves rolled down from dusk until dawn. Trouser legs should be encased in leggings or boots. Bed nets to protect sleeping individuals are highly valuable in preventing malaria. To be effective they must be properly employed and properly maintained. The lower edge must be so tucked in that no opening is available for mosquitoes to enter. Holes and tears should

---

Abstract of TB MED 164, June 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

be repaired promptly. Insect repellent, supplied in 2-ounce bottles, should be applied to exposed parts of the body when outside of screened quarters. It gives good protection against mosquito bites for at least two hours even under sweating conditions.

Suppressive treatment is the administration of certain drugs, such as atabrine or quinine, which, when taken regularly in proper doses, will prevent immediate sickness from malaria even though men are bitten by infected mosquitoes. This measure is highly valuable to maintain the effectiveness of troops who must operate in malarious territory. For discussion of suppressive treatment, see TB MED 65.

In some places, a high percentage of all malaria infection is acquired while soldiers are visiting unprotected towns or villages after dark. Such places should be declared off limits. Swimming and bathing out-of-doors after sundown should be prohibited in areas where there is risk from malaria-carrying mosquitoes. Showing of motion pictures out-of-doors constitutes an important malaria hazard, because men are congregated at a time when anopheline mosquitoes are most active. Properly screened buildings for motion picture shows should be provided in malarious areas so far as possible. All officers and enlisted men should be thoroughly indoctrinated with the facts concerning malaria and with measures necessary for its control. Varied use should be made of different educational outlets, such as poster contests, posters, movie shorts, radio broadcasts, and organizational newspapers. Section IV, W.D. Circular No. 117, 1945, prescribes that all components of the Army shall receive a course covering the various aspects of malaria prevention. The following aids to instruction are available:

FM 21-10, "Military Sanitation and First Aid"; TF 8-953, "Malaria: Cause and Control"; TF 1-3343, "Malaria Discipline"; Film Bulletin No. 200, "Malaria Control on Corsica"; Miscellaneous Film No. 1046, "Silent Battle"; Graphic Training Aid 8-4, "Graphic Portfolio on Malaria"; FS 8-64, "Control of Insect-borne Diseases"; and MTP 8-2, "Mobilization Training Program for Medical Units of the Army Service Forces."

Environmental control measures include procedures such as mosquito-proofing of buildings, draining and filling of mosquito breeding places, and spraying and larviciding, all of which have their greatest usefulness at permanent bases and semifixed installations. However, these measures should be applied in forward positions as soon as the military situation permits. The selection of a suitable camp site is an important antimalaria measure. Camps should not be located within flight range of large breeding places of mosquitoes or of native villages which provide a reservoir of infection. The effective flying range of malarial mosquitoes rarely exceeds one mile. It is also important, where feasible, not to allow native laborers to live on a military reservation or within a mile of military quarters.

Mosquito-proofing of buildings is one of the most effective measures in reducing malaria. Not only sleeping quarters, but also washrooms, latrines, mess halls, day rooms, post exchanges, theaters, and all other buildings where personnel may congregate indoors during the evening should be tightly screened. Proper routine maintenance of screening is essential, with prompt repair of rents and tears, and discovery and blocking of new cracks and knotholes. One of the most effective means of breaking up the cycle of malaria transmission is the destruction of the adult mosquito. The aerosol insecticide dispenser, containing pyrethrum and DDT in solution, is used for spraying all types of inclosures such as barracks, billets, tents, bomb shelters, trenches, foxholes, jungle shelters, mosquito bars, jungle hammocks, and gun emplacements, as well as aircraft and ships. When aerosol dispensers are not available, liquid finished spray dispensed

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

from flit-gun type sprayers should be used to kill adult mosquitoes inside buildings. DDT residual spray applied to tents, screens, and the walls and ceilings of buildings leaves a residue which kills mosquitoes and other insects which alight or crawl on the treated surfaces. This toxic effect persists for from two to three months. Application of DDT residual spray to the habitations of native carriers of malaria is an especially important control measure (see TB MED 110).

Control of mosquito breeding is accomplished either by draining or filling the breeding areas or, when this is not possible, by treating them with chemicals which kill the larvae before they can transform into adult mosquitoes. Drainage programs for malaria control should be carefully planned and integrated with the usual system of drains. Provision should be made to maintain ditches after they have been dug. Many water-holding depressions can be eliminated by filling. This is particularly true of small collections of water in hoofprints, road ruts, shell holes, and bomb craters. The breeding of mosquitoes in marginal pools and collections of flotage in otherwise freely running streams and canals often requires considerable attention. In such situations stream margins should be straightened and cleaned of vegetation.

To be effective in controlling mosquito breeding, larvicides must be reapplied at intervals of from a week to ten days. Three types of larvicides are available—DDT, oil, and Paris green. The use of DDT as a solution in oil or as a dust for larvicidal purposes is described in TB MED 14. Oil itself (Diesel or fuel oil No. 2) is an effective larvicide. Oil solutions may be applied to water surfaces by hand sprayer, knapsack sprayer, power sprayer, or by merely pouring it on the surface. Using Diesel oil No. 2, from 10 to 30 gallons are required per acre of water surface for complete coverage with a uniform stable oil film. When 5 percent DDT in oil is used, only 1 or 2 quarts per acre are required. It is usually necessary to spread oil once a week. Continuous oilers are useful where the oil will be dispersed by currents, as in streams or ditches. It must be pointed out that continuous oilers require a good deal of attention, generally use more oil than would be dispensed for the same area from a knapsack sprayer, and are often unreliable. For large-scale area control, specially equipped aircraft may be employed to spray oil solutions of DDT. Application at the rate of from 0.2 to 0.4 pound of DDT per acre will give good kill of adult mosquitoes in addition to the larvicidal effect.

Paris green (an aceto-arsenite of copper) properly applied is a highly effective anopheline larvicide. Although the specific gravity of Paris green powder is greater than that of water, it usually remains on the surface for at least several hours. It is frequently the larvicide of choice for the treatment of rice fields where oil solutions might injure the plants. Dust mixtures are prepared with diluents such as powdered soapstone, slaked lime, or road dust. The required dilution of Paris green varies from 5 to 10 percent by *volume* for hand-operated dusters and from 1 to 2 percent for hand casting. When dusted from airplanes 25 percent mixtures are usually employed. Paris green mixtures can be applied to ponds, lakes, and larger streams with rotary dust blowers by putting the dust into the air from the windward side so that it will form a cloud and be carried out over the water. From 1 to 3 pounds of Paris green are generally required per acre of water surface.

In some areas stream-breeding anophelines may be controlled by periodically sluicing the stream. A small dam is built to impound water which can be suddenly released to flush away the larvae. Where irrigation water in rice fields or canals is a source of breeding, effective mosquito control is sometimes possible by interrupting the supply of water so that the fields become just dry enough each week to remove the surface film of moisture

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

without drying the roots of the plants. Periodic fluctuation of the water level in ponds and reservoirs is sometimes very effective in controlling mosquito breeding by preventing growth of shore-line vegetation favorable to the larvae. In some areas routine attention must be paid to artificial breeding places such as wells, cisterns, roof gutters, and various types of household water containers, tin cans, and coconut shells. These may be screened, emptied, oiled, or destroyed as indicated. In wells, and pools without much vegetation, some help in larval control may be had by using larva-eating fishes, such as *Gambusia affinis*.

The procurement and distribution of antimalaria supplies are of the utmost importance in establishing early effective malaria control. Commanding officers of all echelons in malarious areas must pay the strictest regard to these items in all logistical considerations. W.D. Circular No. 117, 1945, specifically directs that antimalaria supplies will be given highest priorities of movement to and especially within malarious theaters. Allowances of antimalaria supplies for various geographical areas are published in W.D. Circular No. 163, 4 June 1945.

As in all other aspects of field operations, discipline is the mainstay of malaria control under combat conditions. Without malaria discipline in the field of combat, fighting forces can be and have been decimated by malaria in a month. The malaria rate of an organization is a good index of the efficiency of its command. Malaria control is never automatic. It requires unremitting attention to detail. In field operations troops must be indoctrinated to the point where personal protective measures are a matter of unthinking habit. Sickness of an individual not only impairs fighting efficiency of the unit, but also is a handicap to survival of that individual when in contact with the enemy.

DRUG SUPPRESSIVE TREATMENT OF MALARIA

Although there is no drug known which will prevent mosquito-borne infection with malaria, either atabrine or quinine taken regularly in proper doses will suppress the onset of symptoms of the disease. These drugs are therefore useful to keep men on their feet during urgent military operations.

Eventually, when suppressive treatment is discontinued, most individuals who have been infected will become acutely ill with malaria. However, when suppressive treatment with atabrine is taken as recommended, a high proportion of infections with *Plasmodium falciparum* will never become clinically active. Experience during this war has demonstrated conclusively that when discipline in taking atabrine is adequately enforced, noneffectiveness from malaria can be kept at a satisfactorily low level in combat troops. Fortunately, increased parasite resistance to atabrine does not appear, even after prolonged suppressive usage. Clinical attacks which occur during or following suppressive treatment respond promptly to further treatment with atabrine in the usual clinical doses. After cessation of suppressive treatment, the majority of attacks will occur within two to four weeks. In some individuals, however, infection remains latent, and the primary attack may not occur until months after the drug is stopped. It must be remembered that suppressive treatment is not a truly preventive measure. Consequently, if the risk of infection is sufficiently great to necessitate the use of suppressive treatment, it is all the more important to stress mosquito control and individual protective measures.

Atabrine is the drug of choice for suppressive treatment. Experience has shown that it is more effective than quinine and, as a rule, is better

Abstract of TB MED 65, 3 July 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

tolerated and preferred by troops. In rare instances when individuals are unable to tolerate atabrine, quinine may be employed in 10-grain daily doses as a substitute. When suppressive treatment with atabrine is instituted, it is not uncommon for a small percentage of individuals to show symptoms of intestinal disturbance after one or more of the first few doses. These symptoms are never serious and almost invariably soon disappear if the drug is continued. During continued administration of atabrine a yellowish discoloration of the skin may appear. This is not a sign of toxicity but is due to the fact that the drug is a dye. The discoloration disappears within a few weeks after the drug is stopped.

In highly malarious regions, especially under the stress of combat, suppressive treatment may fail to prevent clinical symptoms in a certain percentage of cases. Failure to take the prescribed doses of the drug is almost invariably responsible for these "break-through" infections. Patients with clinical attacks occurring during suppressive treatment should be given a course of clinical treatment, following which suppressive treatment should be resumed, if still indicated.

The recommended method of administration of atabrine for suppressive treatment is to give one tablet (0.1 gram, 1½ grains) daily at the morning or evening meal, total 0.7 gram per week. This routine dosage leads to relatively few cases of initial intolerance and virtually no cases of continued intolerance. It is essential that a proper system for supervising the administration of the drug be required. This is the responsibility of the unit commander. It is recommended that:

1. The drug be administered by roster to both officers and men.

2. A competent noncommissioned officer witness the actual swallowing of the drug by each individual.

3. By checking the roster regularly, all individuals who have failed to take the drug be required to report and take an extra tablet at subsequent musters until the amount missed has been made up.

4. Men on detached duty, such as patrol, be given drug sufficient for the period they are to be away and explicit directions for taking it.

There are certain advantages in starting suppressive treatment one or two weeks in advance of exposure when it is practicable to do so. First, opportunity is afforded to discipline officers and men in the routine of taking atabrine. Second, such reactions of intolerance which may sometimes accompany the first few doses are experienced before the men engage in combat activities. Third, effective plasma concentrations of the drug are achieved earlier during the period of exposure.

Previously, it has been recommended that suppressive treatment be stopped as soon as feasible upon withdrawal to sanitated or relatively nonmalarious areas. However, experience has shown that when units have been heavily seeded with malaria it may be necessary to continue suppressive treatment in order to maintain the military effectiveness of the unit even though there is no further exposure to infection. Otherwise, relapses may be so numerous as to interfere with rehabilitation and training and prevent further active service of the unit. When suppressive treatment is eventually discontinued in a large force, it may be necessary to stagger the cessation of the drug in order not to overtax hospital facilities. Individuals leaving a malarious area under suppressive treatment should continue to take the drug until they are located in such circumstances that an attack of malaria, should it occur when the drug is stopped, can be properly and conveniently treated. In any event, suppressive treatment with atabrine should be continued for a period of at least four weeks beyond the time of last exposure in the malarious area.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

USE OF DDT AS A MOSQUITO LARVICIDE

For larvicidal purposes, DDT is supplied as commercial grade DDT and as a 10 percent mixture of micronized DDT with talc known as Larvicide, DDT, powder, dissolving, and Larvicide, DDT, powder, dusting, respectively. In these forms DDT can be prepared for application as a larvicide either as an oil solution or as a dust. Oil solutions of DDT make highly effective larvicides, and only a few quarts of solution are required to treat an acre of water surface, as compared with 10 to 20 gallons when ordinary oil is used alone.

To prepare a 5 percent (weight/volume) solution, DDT (Larvicide, DDT, powder, dissolving) is dissolved at the rate of 7 ounces DDT to 1 gallon of oil. Petroleum products such as kerosene, fuel oil, Diesel oil, and waste crankcase oil are satisfactory as solvents. The mixture should be stirred at intervals until all of the DDT is in solution, which may require twenty-four hours. Solution may be hastened by placing the mixture in the sun. For control of mosquito larvae, it is recommended that oil solutions of DDT be applied at such a rate as to give 0.2 pound of DDT per acre. This amount of DDT is contained in 2 quarts of 5 percent oil solution. The treatment should be repeated every six to nine days. In order to obtain complete coverage it is often advantageous to use equivalent amounts of DDT in more dilute solution (1 or 2 percent). This is particularly true when spreading properties are diminished in the presence of an algal scum or heavy growth of surface vegetation. Under ideal circumstances larger doses of DDT up to 5 pounds per acre may give residual effects up to three weeks. This dosage is not recommended, however, where wind, rain, or other inclement circumstances are likely to break up or remove the surface film. Dosages of DDT greater than 0.2 pound per acre may kill fish and be harmful to wild life.

The same methods of mosquito larviciding as employed with oil alone may be used to dispense the DDT oil solution, except that smaller volumes are applied. Sprayer, insect, knapsack type, plunger type, cylindrical shape, 3-gallon capacity, an engineer item, is a practical and economical apparatus for applying DDT oil solutions to ditches, small ponds, or other collections of water which can be reached by the spray. Large power sprayers may be employed to oil extensive areas such as the borders of lakes or, in some instances, swamps. A fog type of spray is required when 5 percent DDT oil solution is dispensed, utilizing wind currents to distribute the material. Continuous action flit-gun sprayers are suitable for dispersal of DDT solutions. Decontamination sprayers or other types of oil sprayers, with the spray nozzle modified or adjusted to produce a fine spray, are generally satisfactory. In treating streams, standard mechanical methods of the drip-can type can be used. For large-scale area control, specially equipped aircraft may be employed to spray oil solutions of DDT. Application at the rate of from 0.2 to 0.4 pound of DDT per acre will give good kill of larval mosquitoes as well as of adults.

For control of anopheline mosquitoes, 1 to 5 percent DDT in dust can be used very much in the same manner as Paris green dust. Any available finely divided material—such as soapstone, condemned flour, or road dust—may be used as a diluent. DDT dust mixture may be applied with a hand rotary duster at the rate of 0.2 pound of DDT per acre. When the dust is distributed by hand casting, the stock dust should be mixed with 50 parts of diluent in order to make it easier to maintain a rate of distribution of 0.2 pound of DDT per acre. In general, oil solutions are more satisfactory for routine use than dust preparations.

DDT in oil solution is absorbed through the skin and may cause toxic

---

Abstract of TB MED 14, 3 March 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

effects. Occasional contact with oil solutions is apparently not harmful, but repeated or prolonged exposure should be avoided. Clothing contaminated with DDT solutions should be removed as soon as possible and the skin bathed with soap and water. Sprayers should be checked frequently to prevent leakage. DDT is poisonous if ingested and consequently must never be stored with foodstuffs.

The introduction of DDT has provided an important new weapon for the control of mosquitoes. The high toxicity of DDT for mosquito larvae permits more effective control of mosquito breeding.

USE OF DDT AS INSECTICIDE TO KILL ADULT MOSQUITOES

When DDT solution is sprayed on interior surfaces, a residue is left which is toxic to insects alighting on the treated areas for several months. This characteristic of DDT, in which lies its extraordinary value, is referred to as residual effect. Only brief contact by the insects with a treated surface is required to give a lethal dose. Use of DDT residual spray is the first method thus far developed which offers an efficient and easy procedure for long-time destruction of mosquitoes infected with malaria parasites, filariae, and other disease agents.

Preparations of DDT suitable for residual effect are listed in W.D. Circular No. 163, 4 June 1945. Insecticide spray, DDT, residual effect, represents the finished product ready for use. An equivalent preparation can be obtained by making a 5 percent solution of Larvicide, DDT, powder, dissolving, in kerosene.

DDT as a residual spray may be applied by a number of methods. Where available, a gasoline engine compressor type of paint-spraying unit will offer an easy and effective means of application. The unit may be mounted on a truck, jeep, or other means of conveyance to facilitate mobility. Knapsack sprayers, supplied by the Corps of Engineers, and the flit-gun type of hand sprayer (Quartermaster issue) also offer satisfactory means of application. Solutions of DDT may be applied by hand, preferably using a paintbrush, where other equipment is not available. This method is the most economical means of application on wire screens, mesh surfaces, and light cords.

It is recommended that DDT residual spray be applied to interior surfaces in dosages of 200 mg. per square foot. This represents 1 quart of the 5 percent spray solution per 250 square feet, and may be expected to provide a residual effect up to three months on interior surfaces. Dosage should be varied and application repeated as indicated by local observations of effectiveness. In applying 5 percent DDT residual spray, the sprayer nozzle should be held approximately 1 foot from the surface to be treated. The area should be sprayed to the point of wetness; there should be no run-off. All surfaces where mosquitoes are likely to rest should be treated. The droplet size should be moderately coarse. If too fine a spray is used, the material will drift throughout the room, whereas if the spray is too coarse, large droplets will fall to the floor before reaching their objective.

In addition to the treatment of barracks, tents, mess halls, theaters, day rooms, lavatories, latrines, and other structures used by military personnel, it is highly important to spray nearby native habitations. Natives usually are reservoirs for malaria and other disease organisms. Killing of mosquitoes in native houses destroys the insects at the time they become infected, thus breaking the chain of transmission. Other insects coming in contact with the residue of DDT will also be destroyed, thereby offering additional results in the control of flies, bedbugs, roaches, and other insect

---

Abstract of TB MED 110, 25 October 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

disease vectors and pests. When spray is not available, DDT dusts may be used but they are not considered as efficient as the spray for use indoors as a residual insecticide.

DDT in 5 percent solution in Diesel oil or kerosene distributed out-of-doors has not only direct killing effect on adult mosquitoes resting in vegetation and other hiding places, but also may exert residual action on insects that later fly into and rest in treated areas. Barrier zones may be established around bivouac areas, gun emplacements, observation posts, outdoor motion picture theaters, and other gathering places. Temporary reduction of the mosquito population is obtained with a dosage of 1 quart of 5 percent solution (0.1 pound of DDT) per acre. Dosages of 2 to 4 pounds of DDT per acre have given residual action for two to three weeks. Heavy rainfall and other weather factors may have an adverse effect on residual action.

The most practicable method for large-scale outdoor distribution of DDT is by airplane. The Husman-Longcoy type of spray equipment developed for Cub plane or, for larger pay loads of insecticide, B-25 and C-47 aircraft equipped with spray apparatus have been used extensively to obtain wide and efficient distribution of DDT-oil solutions for immediate kill. Dispersal by aircraft has the advantage of yielding excellent larviciding effects as well as a toxic action on adult mosquitoes in the treated areas.

The use of DDT as a residual spray for the destruction of mosquito adults, especially in native habitations, is considered to be the most effective application of this agent in malaria control. Its use in this respect should be given high priority. Since DDT does not give an immediate knockdown, its use in dwellings where troops are quartered must be supplemented by spraying with the aerosol dispenser or with liquid finished sprays which have a more rapidly toxic effect. The warning that DDT is not a panacea in insect control is repeated. DDT is only an additional weapon. Its use must be attended by the application of all other control measures with continued vigor.

RODENT CONTROL

The Army is concerned with rodents because they are reservoirs of some diseases affecting man. Plague is first in importance among rodent-borne diseases. Endemic or murine typhus, also of importance, is transmitted to man by the bite of the rat flea. The causative organisms of various types of bacterial food poisoning infect rats and mice and may be transmitted to man by the contamination of his food with their feces and urine. Other diseases associated with rodents are infectious jaundice (Weil's disease), ratbite fever, tularemia, Rocky Mountain spotted fever, and scrub typhus.

The responsibility for the initiation and supervision of measures to protect personnel against rodent-borne disease is vested in the Medical Department. The work on real property is done by the Corps of Engineers, and commanding officers are responsible for putting into effect the provisions for the protection of personnel from rodents.

The common domestic rodents are the Norway rat and the black rat. Rats are furtive, nocturnal creatures which seek shelter near a supply of food and water. They are omnivorous, adaptable to almost all climates, and extremely prolific. Evidences of rat infestations are droppings, runways, tracks, burrows, nests, gnawings, damage, odor, and the presence of live or dead rats. Surveys for rodent infestations should determine the locations infested, the relative numbers and species of rodents involved, the sources of food and water, rat harborages, and the proper con-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

trol methods to use. Particular attention should be paid to mess halls, warehouses, and refuse disposal areas.

Control work should be continuous rather than intermittent. After the removal of their food supply and elimination of shelters, the rodents should be destroyed by poisoning preceded by prebaiting. Zinc phosphide is the rodenticide for general use. Thallium sulfate, a very toxic salt, is reserved for special application. Rat infestations in ships or buildings which can be made gastight can be eliminated by fumigation, using HCN gas. For rats in burrows, a fumigant dust giving off hydrocyanic gas when acted on by the moisture in the air is recommended. Trapping is recommended to ascertain the density of the rat population, to remove rats that survive poisoning and gassing, as a method of collecting rat specimens, or for those places where it is not advisable to use poisoned bait or gas. Trapping is recommended to control mice. Field rodents may be a problem where they are reservoirs for bubonic plague and scrub typhus or where they cause damage. Control measures must be adapted to the species and to field conditions. Where rodent-borne disease may constitute a problem, a rodent survey should be made, including the location of centers of high rodent infestation, the collection of rodent specimens and their ectoparasites, and the laboratory examination of these specimens for evidence of disease.

Control of plague and other rodent-borne diseases involves the destruction of rodents and preventing their parasites from attacking man. In some cases it will be necessary to protect against the parasites by use of insect repellents or by destroying them in dwellings or on individuals by use of DDT.

TB MED 144 gives information on poison formulas, first aid for poison cases in humans, a key to the identification of rats, a proposed TO/E of a rodent survey and control team, and the distribution of certain diseases associated with rodents.

NEUROTROPIC VIRUS DISEASES

The diseases in this group which are of special importance include poliomyelitis, lymphocytic choriomeningitis, equine encephalomyelitis, eastern and western types, Japanese B encephalitis, and Russian spring-summer encephalitis. In addition to these specific types, sporadic cases of encephalitis appear in interepidemic periods which usually cannot be identified on an etiological basis. The clinical features of the various encephalitides are quite similar, and a specific diagnosis can be made only by a laboratory equipped to study the neurotropic viruses. Table I summarizes some of the important features of each of these diseases. For laboratory aid in the specific diagnosis there are two procedures: (1) *Virus isolation.* For this purpose specimens must be obtained during the febrile period. Using sterile precautions, collect 25 cc. of whole blood, draw off the serum after clotting, freeze in dry ice, and ship in the frozen state packed in dry ice to the nearest laboratory equipped for virus isolation. No preservative should be added. Virus isolation may also be accomplished from brain tissue of fatal cases, either frozen or glycerolized for shipment. (2) *Neutralization and complement fixation studies.* For this purpose blood serum collected as above or spinal fluid may be utilized. It should be refrigerated during shipment but need not be frozen. At least two specimens should be obtained on each case; one as early as possible, and the second two weeks later.

A vaccine is available for immunization against Japanese B encepha-

---

Abstract of S.G.O. Circular Letter No. 74, dated 19 March 1943, and TB MED 181, "Japanese B Encephalitis," July 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

litis. This is Medical Supply Catalog Item No. 1606050, 20 cc., a noninfective formalinized preparation of mouse brain tissue. The procedure consists of two subcutaneous injections of 2 cc. each, with an interval of three days

TABLE I

The more common neurotropic virus diseases

	Geographic distribution	Seasonal distribution	Transmission	Clinical features	Prevention
St. Louis encephalitis	Widespread?	Late summer	Mosquito (Culex?); animal reservoir possible	Case fatality 22%	Mosquito control
Japanese B encephalitis	Japan, Formosa, Korea, eastern China, eastern Manchuria, maritime district of U.S.S.R.	Late summer	Mosquito (Culex?); animal reservoir possible	High fatality (57%)	Vaccination; mosquito control
Russian encephalitis	Siberia, maritime provinces	Late spring-early summer	Ticks; animal reservoir	Paralysis of shoulder girdle muscles common	Avoidance of tick bites
Eastern equine encephalomyelitis	Eastern United States	Late summer	Mosquito vector probable; bird and mammal reservoir	Frequent oculomotor palsies and neurological residuals; common in children	Vaccination? Mosquito control
Western equine encephalomyelitis	Western United States	Late summer	Mosquito vector (Culex); bird and mammal reservoir	Affects adult males chiefly	Vaccination; mosquito control
Lymphocytic choriomeningitis	Widespread	Endemic at all seasons	Infected excreta of house mice	Protean manifestations; low fatality	Rodent control
Poliomyelitis	Worldwide	Late summer and fall in temperate climates	Uncertain; several possible modes (contact, food, flies)	Most frequent in children; residual paralyses	No proved method. Sanitary measures important

between doses. Vaccination should be undertaken only in the presence of cases suspected of being Japanese B encephalitis from the location of cases, seasonal distribution, and presence of the disease in epidemic form in the civilian population. Mosquito control measures are probably of much value in the prevention of this disease, since there is considerable evidence that it it transmitted by various species of mosquitoes, including several culicine species and possibly species of *Aedes*.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

PENICILLIN TREATMENT OF SYPHILIS

TB MED 106 introduces penicillin treatment of syphilis in the Army, and outlines administrative and professional details involved.

Penicillin will be used in the treatment of the following types of syphilis: (1) untreated primary and secondary syphilis, (2) untreated latent syphilis, (3) treated primary and secondary syphilis which has failed to respond to mapharsen-bismuth therapy, and (4) treated primary, secondary, and latent syphilis intolerant of or sensitive to mapharsen-bismuth therapy. The total dosage of penicillin will be 2,400,000 units given in sixty consecutive intramuscular injections of 40,000 units at three-hour intervals.

Posttreatment observation. All cases treated with penicillin will have a monthly inspection and quantitative serologic test for syphilis for a period of twelve months. In primary and secondary syphilis the spinal fluid will be examined as soon as feasible after completion of six months of observation. The syphilis register will not be closed until this examination has been accomplished.

In favorably responding primary and secondary syphilis the lesions heal rapidly and the serologic test gradually returns to normal. The majority of cases become negative between the second and fourth posttreatment months, although earlier and later reversals occur. The critical period for relapse appears to lie between the third and sixth posttreatment months.

Determination of treatment failures requires care, since nonsyphilitic intercurrent skin eruptions may develop. Clinical relapse is generally accompanied by serologic relapse. Treatment failures fall into the following categories: (1) Mucous and/or cutaneous relapse, (2) serologic relapse, (3) serum-fastness, (4) neurologic relapse, (5) ocular relapse, (6) osseous relapse, and (7) visceral relapse. Serum-fastness in primary and secondary syphilis is manifested by failure of the quantitative serologic test to show a consistent and maintained fall to negative. This condition will be considered a treatment failure when present six months after the completion of therapy of *primary and secondary syphilis.* It will not be considered a treatment failure in latent syphilis.

Management of penicillin failure. Cases of neurologic relapse and asymptomatic neurosyphilis will be managed in accordance with TB MED 48, 31 May 1944. All other forms of treatment failure will receive a second course of penicillin consisting of 4,000,000 units, given in eighty consecutive intramuscular injections of 50,000 units at three-hour intervals day and night for ten days. Posttreatment observation will be similar to that provided after initial treatment. Failures after a second course of penicillin will be transferred to a neurosyphilis center for further evaluation and treatment.

MANAGEMENT OF NEUROSYPHILIS

The administrative and professional management of individuals with neurosyphilis in the Army is outlined in this bulletin. Despite adequate and continuous antisyphilitic treatment, an appreciable number of individuals with syphilis will develop some degree of central nervous system involvement requiring specialized treatment. All military personnel diagnosed as having asymptomatic or symptomatic neurosyphilis will be transferred as soon as practicable to one of the named general hospitals designated as neurosyphilis centers (W.D. Circular No. 347, 25 August 1944, and subsequent directives).

In the diagnosis of neurosyphilis the following considerations will be taken into account: (1) *Asymptomatic neurosyphilis.* This is neurosyphilis without symptoms or physical (neurologic or psychiatric) signs of the

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

disease. The diagnosis is based on routine examination of the spinal fluid. The tests on which such a diagnosis depends are cell count; Pandy or Nonne-Apelt qualitative tests for protein; quantitative estimation of total protein content; complement fixation (Wassermann) test; and colloidal gold test. The Wassermann test is the only one of these specific for syphilis, and even this test *when unsupported by other spinal fluid abnormalities* requires repetition before acceptance as evidence for the diagnosis of asymptomatic neurosyphilis. If the Wassermann test is not definitely positive, other tests on the borderline of normality should be repeated after an interval of not less than two weeks in order to exclude technical error. In general, the diagnosis of asymptomatic neurosyphilis depends on the interpretation of the pattern of these five tests, rather than on normality or abnormality of any one of them. (2) *Symptomatic neurosyphilis.* Where symptoms or physical signs suggest such a diagnosis, appropriate serologic examinations of blood and cerebrospinal fluid will aid in the clinical classification of the case. From the clinical standpoint, symptomatic neurosyphilis may be divided into five broad categories which are: (a) acute syphilitic meningitis, (b) diffuse meningovascular neurosyphilis, (c) vascular neurosyphilis, (d) tabes dorsalis, and (e) general paresis.

The basic therapy provided in the neurosyphilis centers is fever in the form of malaria, plus penicillin. Individuals with minor neurosyphilitic involvement will be returned to duty, and follow-up and subsequent treatment will be carried out in accordance with recommendations made by the neurosyphilis center. (TB MED 48, 31 May 1944)

CHANCROID, LYMPHOGRANULOMA VENEREUM, AND GRANULOMA INGUINALE

Chancroid is caused by the *Hemophilus ducreyi*, transmitted only by direct contact, and characterized by painful single or multiple genital ulcers. The incubation period is usually three to five days. It begins as a vesicopustule which breaks down rapidly leaving a sharply circumscribed, shallow, painful ulceration. Multiple lesions may develop rapidly by autoinoculation. Regional adenitis frequently develops within a few days to two weeks. The bubo is usually large, unilateral, soft, fluctuant, acutely inflamed, and tender.

Primary syphilis may clinically resemble chancroid and must be confirmed or ruled out by laboratory tests. Local antiseptic applications must not be made until at least three negative darkfield examinations of the lesion or of lymph node puncture material are obtained on successive days. A blood serologic test for syphilis should be made on admission, repeated once a week for the first month, and at monthly intervals for three months.

Sulfadiazine should be administered in a dosage of 1 gm. (15 gr.) four times a day for five to seven days. Locally, nothing but cleanliness (soap and water) is necessary. If the patient is sulfonamide-sensitive, local application of mild antiseptics may be used.

The bubo should never be incised. If fluctuation is present, aseptic aspiration with a 16-gage needle is recommended.

Lymphogranuloma Venereum

Lymphogranuloma venereum is a systemic, venereal, virus disease characterized by a small evanescent herpetiform initial lesion frequently followed by regional lymphangitis and adenitis.

A positive Frei test aids in the diagnosis but may represent a past infection. Syphillis should be ruled out by darkfield examinations and by

---

Abstract of TB MED 157, April 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

serologic examinations which should be repeated monthly for at least three months. Low titer false positive serologic tests for syphilis may occur in this disease.

Sulfadiazine should be administered in a dose of 1 gm. (15 gr.) three times daily for twenty-one days. Fluctuant nodes may be aspirated; but incision and drainage should not be used. Radical excision is inadvisable because of the risk of lymphatic obstruction.

Granuloma Inguinale

Granuloma inguinale is a chronic, mildly contagious, progressive disease, characterized by the presence of Donovan bodies. The initial lesion is a sharply defined, usually painless granuloma, involving the skin of the genital or inguinal region and spreading gradually. Rarely, it is a systemic disease involving bones, joints, and viscera.

Fuadin (a complex antimony compound) is supplied in ampules containing 6.4 percent solution (0.064 gm. fuadin, 1 gr. in 1 cc.) for intramuscular use. The first three doses of 1.5 cc., 3.5 cc., and 5 cc. are given on successive days, followed by 5 cc. two or three times weekly until complete healing has taken place and, in order to prevent relapse, continued at weekly intervals for six months after complete healing. The most commonly reported toxic symptom is vomiting. Rarely, joint and muscle pains may appear. If any toxic symptom occurs, the dose should be reduced.

If there is no response to fuadin therapy after six weeks of treatment, antimony and potassium tartrate should be administered. The drug in 1 percent solution is administered intravenously and should be given slowly. The first dose is 3 cc. Provided no untoward reaction occurs, subsequent doses are given on alternate days and are increased on each occasion by 3 cc. until the maximum individual dose of 12 cc. is reached. If no toxic reaction appears, the maximum tolerated dose may be given three times weekly for fifteen doses.

TREATMENT OF GONORRHEA

Penicillin is the drug of choice in the treatment of gonorrhea. Penicillin therapy of uncomplicated gonorrhea may be carried out as a hospital, outpatient, or dispensary procedure. It is desirable, whenever possible, that treatment be administered without hospitalization. The initial treatment schedule recommended is 20,000 units intramuscularly every two to three hours for a total dosage of 100,000 units. Patients in whom a favorable response is not evident by the third posttreatment day should be re-treated with the same schedule. Those patients not responding to a second course should be hospitalized and given a prolonged and intensive third course of penicillin totaling not less than 300,000 units, administered in 20,000 unit intramuscular injections every three hours. Individuals who fail to respond to the third course of penicillin should be treated with one course of sulfadiazine or sulfathiazole in a dosage of 4 gm. initially, followed by 1 gm. every four hours night and day for five days. Patients with complications of gonorrhea should be hospitalized and given prolonged, high dosage of penicillin. Individuals who fail to respond to the schedules of treatment outlined above should be referred to regional hospitals for evaluation and further therapy.

Determination of cure. (1) In the male: Relapses following penicillin treatment are infrequent. The presence of urethral discharge is not considered of sufficient import to prolong hospitalization or to continue treatment on a dispensary or outpatient status, provided the gonococcus cannot be demonstrated by smear or culture. Follow-up should include weekly hysical inspection and microscopic examination of urethral discharge or

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

urinary sediment for three weeks after completion of penicillin therapy. Prostatic massage or urethral instrumentation will ordinarily not be done. (2) In the female: Cure will be determined by absence of tender masses or points of tenderness and by inability to demonstrate the gonococcus by smears and cultures (when available). Such tests will be repeated on an ambulatory basis at weekly intervals for three weeks after disappearance of symptoms and signs.

Serologic tests for syphilis. It is particularly important that patients be carefully followed with respect to the possible development of primary and secondary syphilis. Since penicillin is therapeutically effective in early syphilis as well as in gonorrhea, the development of primary syphilis may be retarded or masked by penicillin therapy of gonorrhea. Blood tests for syphilis should be performed at the end of the follow-up period, and careful clinical and serologic study repeated at the end of three months. (TB MED 96, 21 September 1944)

BAL IN OIL FOR TREATMENT OF SEVERE MAPHARSEN REACTIONS

TB MED 104 announces BAL in oil for use in treatment of severe mapharsen reactions. BAL in oil is packaged in sterile ampules containing 500 mg. of BAL in 5 cc. (10 percent solution) of injectable material *for intramuscular use only.*

In general, the use of BAL in oil should be restricted to cases with a toxic reaction so serious as to endanger life, or otherwise requiring prolonged hospitalization. It is considered to be a supplemental treatment, and other accepted methods of treatment for arsenical reactions should not be neglected. BAL in oil is indicated in the following types of arsenical reactions: (1) toxic encephalopathy, (2) blood dyscrasias, and (3) arsenical dermatitis.

The recommended dosage is 0.025 cc. of BAL in oil per kilogram of body weight (which is 2.5 mg. of BAL per kilogram of body weight) repeated four times at four-hour intervals during the first day, and once daily for the following six days. In patients who are desperately ill, two injections daily may be given during this six-day period at eight-hour intervals. The individual dose may be adjusted to the body weight in accordance with the following scale: 120 to 140 pounds, 1.5 cc.; 140 to 170 pounds, 1.75 cc.; 170 to 200 pounds, 2.0 cc.

Cases of dermatitis may relapse when treatment is discontinued, but such relapses will usually be controlled by one or two injections daily, at the same dosage level, for five to seven days.

INSTRUCTIONS FOR OPERATING KIT, WATER TESTING, POISONS, TREATMENT CONTROL

The Kit, water testing, poisons, treatment control (Med. Dept. Item No. 9930700), contains apparatus and chemicals to carry out quantitative determinations of: "mustards," "arsenicals" (L), pH, and "chlorine demand." The tests serve to indicate the type of contamination (within limitations of the kit), the feasibility of instituting treatment, and, subsequently, the completeness of decontamination. Equipment is also included for specific qualitative tests for cyanide, lead, thallium, mercury, and selenium. Included in addition to the packing list covering the contents of the kit are complete directions for performing the several tests. (TB MED 37, 28 April 1944)

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

IMMUNIZATION

Technical instruction concerning agents and methods for accomplishing immunizations in accordance with section III, AR 40-210, appear in TB MED 114, 9 November 1944.

Standards, procurement, shipment, and storage of prophylactic biologicals are discussed. Smallpox and yellow fever vaccines must be maintained at freezing temperatures during storage and shipment. Temperatures slightly above freezing are recommended for all other agents, but because of their relative stability deterioration will not necessarily occur during storage for several weeks at ordinary outdoor or room temperatures.

Inquiry for the existence of protein sensitivity should always be made prior to injection of any biologic product. Egg sensitivity is sufficient cause for withholding vaccines prepared by culture in eggs. Epinephrine hydrochloride (1:1,000), for immediate injection if allergic symptoms develop, should be available whenever biologic products are to be used. A detailed report of all unusual reactions will be made to The Surgeon General.

The preparation and maintenance of immunization records are prescribed in AR 40-215, 25 April 1945.

Footnotes to the Table

1. The administration and recording of immunizations will be kept up-to-date as prescribed. Inoculation of inductees should be initiated as soon as feasible after induction (exception—smallpox, unless there is assurance that the individual will be available for inspection at the station for at least one week). When troops are alerted for duty overseas, necessary stimulating and special inoculations will be started as soon as possible, although it may be necessary to complete some of the immunizations at staging areas, ports of embarkation, or on transports. Navy and Marine Corps personnel who have fulfilled Navy immunization requirements should be accepted as satisfying the respective Army requirements for equivalent service.

2. In addition, all male Army Air Forces personnel eligible and physically qualified for oversea duty are required to obtain typhus, cholera, and yellow fever initial immunizations. No stimulating doses of these special vaccines should be given such personnel prior to receipt of orders moving personnel to Army Air Forces staging areas or their equivalent. All installations processing Army Air Forces personnel will provide for the administration of these special immunizations.

3. The requirements of this column are primarily for personnel on first departure from the United States for overseas duty. Personnel going to an oversea theater after brief absence from that or another theater will be assumed to have completed the initial immunization requirements for duty in the theater from which they departed. In no case will such personnel be required to repeat the initial series of immunizations. They should be given only the additional or stimulating doses necessary for service in the areas to or through which they are returning. Personnel making intra- or inter-theater movements or returning to the United States should be immunized before departure in accordance with existing requirements for travel to or through the areas concerned.

4. The prescribed time interval between doses of the various agents should be adhered to, but, when this cannot be done, the missed dose should be administered as soon as possible and the series completed. A new series should not be started. The lapse of a period up to several years since the administration of the initial series of any of the routine or special immunizing agents shown above does not necessitate repetition of the initial immunizations, even though no stimulating doses have been given in the interim. If an initial series has been given at any time in the military service, a single stimulating dose ordinarily will raise the immunity to a satisfactory level.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

5. The interval between the three doses of the initial series of triple-typhoid vaccine may be seven to twenty-eight days. The 0.5-cc. stimulating doses should be given only to those who have completed an initial vaccination series with Army triple-typhoid vaccine.

SUMMARY OF IMMUNIZATION REQUIREMENTS[1]

ROUTINE

Agent and catalog No.	Required		Initial series			Stimulating doses	
	For duty in U. S. (2)	For duty overseas (3)	No. of doses	Individual dose	Recommended interval between doses (4)	When indicated	Amount
Smallpox vaccine (No. 1609000).	Yes	Within 1 yr. (all theaters).	1	Contents 1 capillary tube.		Every 3 yrs. and in presence of the disease.	Contents 1 capillary tube.
Triple typhoid vaccine (No. 1730000).	Yes	Within 1 yr. (all theaters).	3	1st dose—0.5 cc; 2d dose—1.0 cc; 3d dose—1.0 cc.	7 to 28 days.	Annually, and in presence of the disease. (5)	0.5 cc.
Tetanus toxoid (Nos. 1612500 and 1612700).	Yes	Same as for duty in U. S.	3	1.0 cc	Minimum of 21 days.	One year after initial series and upon occurrence of wounds or burns, as directed by the medical officer.	1.0 cc.

SPECIAL

Agent and Catalog No.	Required		Initial Series			Stimulating Doses	
	For duty in U. S. (2)	For duty overseas (3)	No. of doses	Individual dose	Recommended interval between doses (4)	When indicated	Amount
Typhus vaccine (No. 1612800).*	No	Yes, for movement to or through defined endemic areas. (6)	2	1.0 cc	7 days	Seasonally about 1 Nov. and 1 Feb. in endemic areas and in the presence of the danger of typhus.	1.0 cc.
Cholera vaccine (No. 1601500).	No	Yes, for movement to or through defined endemic areas. (7)	2	1st dose—0.5 cc; 2d dose—1.0 cc.	7 days	At 4–6 month intervals in the presence of danger of cholera.	1.0 cc.
Yellow fever vaccine (Nos. 1613000 and 1613200).*	No	Yes (10 days or more before reaching endemic area). (8)	1	0.5 cc of the proper dilution.		Every 4 years	0.5 cc of the proper dilution.
Plague vaccine (No. 1607000).	No	Only on special order or in presence of definite plague hazard.	2	1st dose—0.5 cc; 2d dose—1.0 cc.	7 days	At 6-month intervals in the presence of danger of plague.	1.0 cc.
Influenza vaccine (No. 1605900).*	No	No	1	1.0 cc			

OCCASIONAL

Agent	Indication	No. of doses	Individual dose	Interval between doses	Stimulating dose
Diphtheria toxoid plain (No. 1604100).	Outbreak of diphtheria	4	0.1, 0.5, 1.0, 1.0 cc	48 hrs. between 1st and 2d; 3 to 4 weeks for remainder.	Usually none.
Scarlet fever streptococcus toxin (No. 1608300).	Seldom indicated	5	See directions on package.	1 week	None.
Rocky Mountain spotted fever vaccine (nonstandard).*	Only for personnel exposed frequently to infected ticks.	3	1.0 cc	7 to 10 days	Repeat series annually if indicated.
Immune serum globulin (human) (No. 1605500).	Prevention or modification of measles in susceptible contacts under special conditions.	1	5 to 10 cc within 10 days after exposure to measles.		Usually none.
Tetanus antitoxin (No. 1611000)	Wounded personnel who have not received initial toxoid series.	1	Not less than 1,500 units.		Usually none.
Rabies vaccine (nonstandard).	When bitten by rabid animal	14 or 21 (9)	See directions on package.	1 day	None.

*Egg-culture vaccine.

6. Typhus vaccination is required for personnel stationed in or traveling through Asia, Africa, Europe (including the British Isles), the mountainous regions of Central and South America (including Mexico, but ex-

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

cepting Panama), Alaska, and *the entire Pacific area.*† In highly endemic areas, stimulating doses should be given about 1 November and 1 February and additional doses whenever an unusual risk of exposure exists.

7. Cholera immunization is required for personnel stationed in or traveling to or through Asia, including the area around the Persian Gulf, and *the entire Pacific area.*†

8. Yellow fever immunization is required for those stationed in or traveling to or through the endemic areas which are defined as follows: In the Eastern Hemisphere, that portion of Africa lying between latitude 18° south and the northern borders of French West Africa, French Equatorial Africa, and the Anglo-Egyptian Sudan, including the islands immediately adjacent thereto. In the Western Hemisphere, the mainland of South America lying between latitudes 13° north and 30° south, including the islands immediately adjacent, and Panama, including the Canal Zone. However, transit through the Panama Canal with brief sojourns within the terminal port cities or military posts within the Canal Zone will not be considered as travel through an endemic area. In order to comply with the quarantine regulations of certain countries, individuals traveling to these countries through the endemic areas as defined above must have been vaccinated not less than ten days nor more than four years before entering an endemic area. The individual must carry an immunization register or certificate of immunity.

9. Rabies vaccine is administered for fourteen days when the material used was not prepared according to the technique of Pasteur, and when the wound is elsewhere than on the face. Rabies vaccine is continued for twenty-one days when the vaccine was prepared according to the technique of Pasteur, and when the wound is on the face. The directions for giving this vaccine are contained on printed material which accompanies each set of ampules. Rabies vaccine is administered at the discretion of the medical officer. It should not be given until definite clinical evidence of rabies is observed in the animal or a diagnosis has been established by histologic technique except in the case of face wounds when it should be begun immediately, or in case the suspected animal is not available for examination.

†Italicized statemets differ from TB MED because of changes subsequent to its publication.

INFLUENZA VACCINE

Influenza virus vaccine types A and B, 30-cc. vials (Med. Dept. Item No. 1605900), is a suspension of killed (formalinized) influenza virus, types A and B, made from the allantoic fluid of embryonated chicken eggs. The dose is a single 1-cc. injection given subcutaneously. Conditions under which stimulating doses should be administered have not been determined.

The principal evidence for the value of this vaccine is as follows: (1) Human volunteers sprayed with active virus a short time after vaccination showed a high degree of protection in contrast to a control group. (2) Beginning one week after vaccination, the incidence of naturally occurring disease among 6,000 volunteers vaccinated at or shortly before the beginning of the epidemic of influenza A in November 1943 was one-fourth that of a similar number of unvaccinated controls during the same epidemic.

The degree and duration of protection afforded is not fully determined. At present, the vaccine will be used only in the face of an outbreak of influenza and only when authorized by theater or service command surgeons or higher authorities. (Abstract of TB MED 85, 15 Aug. 1944)

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

HEALTH HAZARDS FROM INDUSTRIAL SOLVENTS

Industrial solvents are commonly used in such operations as degreasing, spray painting, dry cleaning, paint removing, rustproofing, and impregnating. The greatest danger to personnel exposed to these solvents lies in inhalation of the vapor or mist, but intoxication can result from absorption through the skin. Dermatitis is not uncommon as a result of the defatting action of these products.

Clinically, narcosis or asphyxiation may occur after exposure to high concentrations of the solvent vapors. More commonly, the onset is insidious with symptoms involving predominantly the central nervous system or the gastrointestinal system or both. The symptoms related to the central nervous system are headache, giddiness, drowsiness, fatigue, insomnia, tremors, and paresthesias, while those related to the gastrointestinal tract are anorexia, nausea, vomiting, and indefinite abdominal pain. In other instances where the blood-forming organs are particularly affected, aplastic anemia develops and purpuric manifestations are observed. In women menorrhagia may occur.

Chlorinated hydrocarbons primarily damage the liver; consequently one more commonly finds gastrointestinal symptoms with jaundice and, early, a large tender liver. Without treatment, these cases may progress to acute yellow atrophy or cirrhosis. Evidence of renal irritation likewise may be seen.

Benzol (benzene--not benzine) affects particularly the blood-forming organs, with resulting anemia of the aplastic type, together with resulting complications.

Petroleum products such as alcohols, ethers, ketones, esters, and aldehydes have predominantly a narcotic effect; however, severe constitutional disease may result from absorption of these solvents.

Preventive measures must be based on a knowledge of the type of solvent used, the nature of its toxic action, and degree of exposure. Frequently less toxic solvents can be substituted. Inhalation of solvent vapors should be prevented by performing the work outdoors where practicable, or by the use of local exhaust ventilation indoors. In addition, standard gas masks will protect for at least 200 minutes against concentrations of the vapors likely to be encountered. Supplied-air respirators likewise can be used if available.* Skin contact can be avoided by impervious gloves, sleeves, and aprons. A bath at the end of work and washing the hands with soap and water before eating should be required.

Preplacement medical examinations should be performed on all personnel who will be exposed to industrial solvents. Persons with anemia, diseases of the biliary tract, syphilis, diabetes, cardiovascular or renal disease, obesity, and alcoholism should be excluded. Workers should be instructed about the hazards associated with exposure to solvents and in precautionary measures for the prevention of intoxication.

Periodic examinations should be performed and records maintained.

The type of laboratory study will depend on the kind of solvent to which the individual is exposed. For those affecting the liver, examination of blood and urine with respect to bile pigments should be made. For those affecting the blood-forming organs, detailed examinations of the blood should be performed.

Specific information regarding various aspects of the engineering and medical control measures may be obtained from the Office of The Surgeon General.

Abstract of TB MED 35, 27 April 1944.
*The original TB MED referred to a type of mask which is not available in the field.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

INFECTIOUS DISEASES OF RESPIRATORY TRACT

	Etiologic Agent	Source of Infection	Mode of Transmission	Incubation Period	Period of Communicability	a. Susceptibility b. Immunity c. And Prevalence
1. Chickenpox	Virus	Skin lesions, nose & throat secretions	Direct contact, fomites, droplets	2-3 weeks, (14-17 days)	While lesions present; chiefly first few days	a. Universal b. Permanent c. World-wide; winter-spring
2. Coccidioidomycosis	Fungus: Coccidioides immitis	Fungus in dust	Airborne in dust	1-3 weeks (10-14 days)	Unknown	a. General, especially negroes b. Permanent c. (1)
3. Common cold	Viruses, secondary invaders	Respiratory discharges	Contact; droplets	12-72 hrs.	Unknown, brief	a. General b. Short c. Universal, cold months
4. Diphtheria	C. diphtheriae	Respiratory discharges, lesions	Contact with case or carrier, milk. Droplets	2-5 days	Variable, about 2 weeks; may become carrier	a. Variable (Schick test) b. Usual c. Universal - fall-winter
5. Influenza	Virus	Respiratory discharges	Contact; droplets	1-3 days	7-10 days	a. General b. About 1 year c. Epidemic periodically, usually winter
6. Measles	Virus	Respiratory discharges	Contact; droplets	11 days to symptoms, 14 to rash	From 4 days before to 5 after onset rash	a. Universal b. Permanent c. Universal; winter-spring
7. Measles (German)	Virus	Respiratory discharges	Contact; droplets	2-3 weeks (16 days)	Until 5 days after onset rash	a. General b. Permanent c. Universal; winter-spring
8. Meningococcal meningitis	N. intracellularis	Respiratory discharges	Contact with case or carrier; droplets	2-10 days (7 days)	Until recovery	a. Slight b. Unknown c. Universal; winter-spring
9. Mumps	Virus	Oral secretions	Contact; droplets	12-26 days (18 days)	Until swelling subsides	a. General b. Permanent c. World-wide; winter-spring
10. Pneumonia (bacterial)	Pneumococcus usually; Streptococcus, and other bacteria	Respiratory discharges	Contact with case or carrier; droplets	Variable, upwards of 48 hrs.	Variable following recovery	a. Low; many factors b. Slight c. World-wide; winter-spring
11. Pneumonia primary atypical	Probably virus	Respiratory discharges	Contact	Probably 1-3 weeks	Unknown	a. General b. Unknown c. World-wide; colder months
12. Smallpox	Virus	Skin & mucous membrane lesions	Contact; direct and indirect	8-16 days (10-12 days)	Until all scabs are shed	a. Universal b. Permanent c. World-wide; winter-spring
13. Streptococcal sore throat (2)	Hemolytic streptococci, Group A	Respiratory discharges	Contact with case or carrier; droplets	1-7 days (2-4 days)	Extremely variable	a. General b. Considerable c. World-wide; winter-spring
14. Septic sore throat (2)	Hemolytic streptococci, Group A	Milk, or other contaminated food (3)	Food-borne	1-3 days	Extremely variable	a. General b. Variable c. Localized; spring-summer
15. Scarlet fever (2)	Hemolytic streptococci, Group A	Respiratory discharges	Contact with case or carrier; droplets	1-7 days (2-4 days)	Extremely variable	a. General b. Considerable c. World-wide; winter-spring
16. Tuberculosis (pulmonary)	Mycobacterium tuberculosis	Sputum, respiratory discharges, & infected milk	Contact, occasionally infected milk	Not determinable; very long	So long as the bacilli present in sputum	a. Universal b. Resistance varies c. World-wide
17. Vincent's Disease	Complex; Spirillum and fusiform bacillus	Discharges from lesions	Contact	Unknown	While lesions persist	a. General b. Unknown c. Sporadic

From the standpoint of control, the more important characteristics of the infectious diseases of the respiratory tract and of diseases transmitted by respiratory tract discharges are summarized in this table. The entries in the table in many cases are approximations. The statements regarding control should not be taken as an absolute basis for action but will need to be modified according to local situations. They are intended to be ap-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

INFECTIOUS DISEASES OF RESPIRATORY TRACT

Isolation	Concurrent Disinfection	Terminal Disinfection	Quarantine of Contacts	Immunization	Investigation of source	Physical Inspection of Contacts	General
Until lesions healed	Yes. See source	Cleaning	None	None	None if smallpox ruled out	Daily until smallpox ruled out	
None	Discharges	Cleaning	None	None	Determine endemic areas	None	Skin test surveys occasionally useful
No, hospitalize when practicable	Respiratory discharges	None	None	None	Impracticable	None	
3 weeks or until 3 negative cultures or avirulence shown	Respiratory discharges	Cleaning	None	See TB MED 114	Yes, isolate carriers	Daily for 5 days after last exposure	
Yes, into convalescence to protect patient	Respiratory discharges	None	Rarely when localized	See TB MED 114	None	Close surveillance	Laboratory studies of etiology
1 week after onset rash	Respiratory discharges	Cleaning	None	Passive, See TB MED 114	Unprofitable	Daily for 14 days	
1 week after onset rash	Respiratory discharges	Cleaning	None	None	Unprofitable	Daily until measles & scarlet fever ruled out	
While febrile	Respiratory discharges	Cleaning	None	None	Impracticable	Medical surveillance	Sulfadiazine prophylaxis, See TB MED 112
Until swelling subsides	Respiratory discharges	None	None	Convalescent serum (rarely practicable)	Unprofitable	Daily for 21 days	
Until clinical recovery	Respiratory discharges	Cleaning	None	None	None	None	Sulfadiazine prophylaxis, See TB MED 112
Until clinical recovery	Respiratory discharges	None	None	None	Impracticable	None	
Rigid, until all scabs are shed	All articles in surrounding, respiratory discharges	Cleaning and disinfection	Unvaccinated contacts	Vaccination, See TB MED 114	Careful search	Daily for 3 weeks	Revaccinate command. Release contacts after 3 weeks or vaccine reactions
Until clinical recovery and no infectious discharges	Respiratory discharges, purulent secretions	Cleaning and disinfection	None	None	Usually impracticable	Daily for 7 days	Epidemics due usually to single type
Until clinical recovery and no infectious discharges	Respiratory discharges, purulent secretions	Cleaning and disinfection	None	None	Search for cases or carriers among food handlers (3)	Daily for 7 days	Pasteurise milk
Until clinical recovery and no infectious discharges	Respiratory discharges, purulent secretions	Cleaning and disinfection	None	Rarely, See TB MED 114	Usually impracticable	Daily for 7 days	Epidemics usually due to single type
Open cases	Respiratory discharges	Cleaning; sunlight	None	None	X-ray all contacts	X-ray of contacts	Hygiene, education, pasteurization of milk
None	Discharges from lesions	None	None	None	Impracticable	In outbreaks only	Dietary improvement & oral hygiene

plied to military organizations rather than to children and civilians. The data are based on TB MED 47, 28 May 1944.

(1) Chiefly confined to local areas in arid southwest United States.

(2) These diseases have the same etiology and many features in common. Sulfadiazine prophylaxis is applicable to streptococcal sore throat and scarlet fever unless due to a resistant strain of Streptococcus (see TB MED 112).

(3) Organism may enter milk either from bovine mastitis or from infected food handlers.

The table above reads from left to right across both pages.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

SULFADIAZINE PROPHYLAXIS

The administration of small daily doses of sulfadiazine to all members of the command is of value under certain conditions for the control of epidemics of some of the upper respiratory diseases, including meningococcal meningitis and streptococcal disease. It is suggested that this measure be considered if the admission rate for common respiratory disease exceeds 400 per 1,000 per year, provided that more than 20 percent of the cases are of streptococcal etiology; if the combined incidence of scarlet fever and streptococcal sore throat exceeds 50 per 1,000 per year; or if outbreaks of meningitis occur. The recommended procedure is administration of ½ to 1 gm. of sulfadiazine in a single dose daily. This should ordinarily not be continued for more than three weeks. Precautions should be taken to avoid sulfadiazine reactions by questioning personnel as to whether they have ever had a reaction to any sulfonamide drug. Great care should also be exercised to ensure that reactions developing in personnel who are receiving sulfadiazine prophylaxis are quickly recognized and administration of the drug to those individuals is promptly stopped. The most dangerous situation to avoid is the treatment with therapeutic doses of sulfonamides of persons who are suffering from unrecognized sulfadiazine reactions. The medical officer's responsibility is to recommend sulfadiazine prophylaxis when it is indicated, supervise administration of the drug, and take precautions to prevent predictable reactions. Approval must be secured from the appropriate higher medical echelon before prophylaxis is started. When sulfadiazine is being used prophylactically, the Statistical Health Report of the unit should note this fact. Reactions of sensitivity to sulfonamides should be noted on the individual's immunization register. (Abstract of TB MED 112, 1 November 1944)

NUTRITION*

This bulletin defines nutrition, discusses the nature of nutrition in general, presents a classification of food with suggested allowances in the various food groups, gives examples of food allowances, discusses policy on vitamin concentrates, and makes recommendations on the planning of meals.

The various nutrients are carbohydrates, fat, protein, vitamins and minerals, and water. The most economical food for energy is *carbohydrates*. *Fat-rich foods* furnished the most concentrated energy. *Protein* is the *poorest* and most expensive source of energy. Energy requirements at hard work are about 4,500 calories per day. Protein is needed for growth

TABLE I.—*Daily allowance of specific nutrient*

Nutrients	Unit of measure	Moderately active	Very active	Sedentary
	calories	3, 000	4, 500	2, 500
Protein	grams	70	70	70
Calcium	grams	0. 8	0. 8	0. 8
Iron	mg	12	12	12
Vitamin A	international units [1]	5, 000	5, 000	5, 000
Thiamin (vitamin B_1)	mg.[2]	1. 8	2. 3	1. 5
Ascorbic acid (vitamin C)	mg.[2]	75	75	75
Riboflavin (vitamin B_2)	mg	2. 7	3. 3	2. 2
Nicotinic acid	mg	18	23	15
Vitamin D	international units [3]	400	400	400

[1] Requirements may be less if provided as vitamin A; greater if provided chiefly as the pro-vitamin carotene.

[2] 1 mg thiamin equals 333 I. U., 1 mg ascorbic acid equals 20 I. U.

[3] Vitamin D is undoubtedly necessary for older children and adults as well as infants. When not available from sunshine, it should be provided probably up to the minimum amounts recommended for infants (400 I. U.).

Further Recommendations, Adopted 1942: The requirement for iodine is small; probably about 0.002 to 0.004 milligram a day for each kilogram of bodyweight. This amounts to about 0.15 to 0.30 milligram daily for the adult. This need is easily met by the regular use of iodized salt, its use is especially important in adolescence and pregnancy.

The requirement for copper for adults is in the neighborhood of 1.0 to 2.0 milligrams a day. The requirement for copper is approximately one-tenth of that for iron.

The requirement for vitamin K is usually satisfied by any good diet.

*Abstract of TB MED 23, March 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

and repair of body tissues. Animal proteins are in general superior to vegetable proteins. Minimum protein requirements for men at light work are about 1 gram per kilogram (2.2 lb.) of body weight per day. Minerals and vitamins are necessary for health. Each has separate functions, and the lack of any one causes disability. The recommended daily allowances for each vitamin as well as for other nutrients are given in table I.

Food classification and values. The dietary requirements should be obtained from the foods listed in table II. The quantities indicated after each class of food represent average amounts needed to supply a fairly adequate dietary for active troops. A-1 and B-1 represent amounts of each food class to use when a liberal supply of fresh fruits and vegetables is available; A-2 and B-2 represent amounts of each food class when the supply of fresh fruits and vegetables is limited.

TABLE II.—*Classified food allowance*

Expressed as pounds per man per day

Foods	Moderate activity		Avg. for Army	Very active troops	
	Pounds	Pounds	Pounds	Pounds	Pounds
	A-1	A-2		B-1	B-2
Meats	0. 75	0. 75	0. 88	1. 00	1. 00
Eggs	. 125	. 125	. 19	. 125	. 125
Milk (fluid equivalent)	1. 00	1. 00	1. 10	1. 00	1. 00
Butter	. 10	. 10	. 07	. 125	. 125
Other fats	. 056	056	. 06	. 075	. 075
Sugars and syrups	. 25	. 25	. 28	. 25	. 33
Grain products, cereals	. 50	. 50	. 62	. 88	. 90
Legumes, incl. peanut butter	. 031	. 03	. 04	. 10	. 12
Vegetables, L. G. Y	. 44	. 33	. 43	. 44	. 33
Tomatoes	. 20	. 18	. 16	. 14	. 16
Citrus fruits	. 11	. 10	. 25	. 06	. 09
Potatoes	. 50	. 70	. 61	. 90	1. 00
Vegetables, other	. 50	. 25	. 29	. 50	. 25
Fruits, other (fresh and canned)	. 50	. 20	. 44	. 30	. 25
Fruits, dried	. 05	. 05	. 02	. 10	. 10

Policy on vitamin concentrates. Vitamins are essential to the health, welfare, and fighting efficiency of every soldier, but it is more desirable to obtain them in their natural form from foods consumed rather than through the use of synthetic products in tablet form. There is no evidence that vitamins in excess of daily requirements are useful.

No requisition for vitamin concentrates to supplement the ration should be submitted until a medical officer or nutritionist has analyzed the diet, based upon the nutritional value of the foods actually available. In the event it is determined that available foods are being properly prepared, served, and consumed, and still a requirement for vitamins to supplement the ration exists, a requisition should be forwarded with a statement that the diet is inadequate and suitable foods cannot be obtained in quantities sufficient to meet vitamin requirements. Specific evidence of inadequacy should be cited.

NUTRITIONAL VALUE OF PACKAGED RATIONS

W.D. Technical Bulletin TB MED 141, "Nutritional Value and Characteristics of Certain Expeditionary and Packaged Rations," February 1945, informs Medical Department personnel of the characteristics, components, and nutritive content of the various rations used overseas. A brief description is given of each so that Medical Department personnel may make correct reference to them in reports. A brief description of each ration follows:

1. The B ration, known also as expeditionary force ration No. 1, is used

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

overseas where organized messing operations are possible and is as much like the field ration A served in camps in the United States as possible, except that most of the food is canned or otherwise preserved.

2. The 10-in-1 ration is designed for use in support areas and by mobile forces in combat areas where cooking and messing in small groups are feasible. It is packaged in a fiberboard box with sufficient food for ten men for one day or for five men for two days. Variety is afforded by five different menus and by the inclusion of a large number of components within menus.

3. The C ration is a combat ration packed in cans, six per man per day, and designed for use where no messing facilities are available. Three of the cans are meat items, designated as "M" units, while the other three contain biscuits and various confections and are designated as "B" units.

4. The K ration is also a combat ration, consisting of three units packaged in boxes of 7 by 2⅝ by 1⅝ inches. Twelve rations are packaged in one case.

5. The D ration is an emergency ration to be used only when all other rations are not available. It consists of three 4-oz. bars of high-melting-point chocolate fortified with vitamin B_1 and contains about 1,800 calories.

The nutritional composition of the rations is given in the following table:

Table I.—Nutritional composition of rations

Ration	Calories	Protein (gm)	Fat (gm)	Carbohydrate (gm)	Calcium (gm)	Iron (mg)	Vitamin A (i. u.)	Thiamin (mg)	Riboflavin (mg)	Niacin (mg)	Ascorbic acid (mg)
Field ration B	3, 915	122	141	532	0. 996	27	9, 430	1. 98	2. 42	26. 7	103
C ration:											
Up to July 1944	2, 775	121	78	379	. 818	33	18, 370	1. 0	1. 8	28	87
July to October 1944	3, 240	143	114	410	. 800	24	9, 450	2. 5	3. 0	28	80
October through December 1944	3, 396	143	122	436	. 800	22	5, 410	2. 8	3. 0	29	72
1 January 1945 forward	3, 709	148	132	482	. 925	23	5, 430	2. 7	3. 0	28	.12
10-in-1 ration:											
April to December 1944	3, 927	124	171	473	1. 310	22	5, 220	2. 3	2. 7	24	80
1 January 1945 forward	4, 150	130	170	525	1. 150	25	3, 100	2. 7	3. 6	26	75
K ration:											
June to December 1944	2, 786	89	129	317	1. 282	14	4, 674	2. 1	2. 4	15	65
1 January 1945 forward	2, 860	93	122	343	1. 350	17	4, 695	1. 8	2. 5	17	70
D ration	1, 770	32	95	200	. 700	10. 8	-------	1. 50	0. 50	1. 2	------
Recommended daily allowances [1]	[2] 3, 000	70	------	------	. 800	12	5, 000	1. 80	2. 70	18	75
Minir um daily allowances [1]	[2] 3, 000	50	------	------	. 600	6	3, 000	1. 00	1. 50	10. 0	50

[1] Food and Nutrition Board, National Research Council.
[2] For a man of 70 kilos, moderate activity. Calorie need will of course depend on energy expenditure.

FACTORS FOR CONVERSION OF PACKAGES TO POUNDS FOR USE IN DIETARY ANALYSIS OF RATIONS

The Medical Department's responsibilities for the supervision of adequate nutrition in the Army are greatly facilitated by efficient means of evaluating dietaries. The quantitative aspect of nutrition and nutritional accounting are even more important than the customary financial accounting. The reduction of dietaries to a basis of pounds of classes of food per man per day has been found useful in nutritional accounting and requires the conversion of various units of volumetric measures to pounds.

In the original TB MED 25 there are accompanying tables of weights, measures, and factors of use in conversion of the units, packages, or containers of commonly used foods to a single basis—the pound. They are prepared as average figures from the best available sources and related to practical Army conditions. Where exactness is desired, the actual net weight of the unit will have to be determined. Common foods are arranged by classes or groups on the basis of similar nutritive content or unique contribution to the diet, thus facilitating the evaluation of dietaries by elim-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

inating the long and tedious task of considering individual foods.

The diet may be evaluated briefly and rapidly by a mental comparison of the quantities of each class of food supplied with the amount which has been found to be acceptable and nutritionally adequate for a given situation or the diet may be evaluated more specifically by applying weighted group averages of various nutrients such as protein, carbohydrate, fat, calcium, phosphorus, iron, vitamin A, thiamine, ascorbic acid, riboflavin, and nicotinic acid to the average consumption of each class of food reduced to pounds per man per day.

FACILITIES FOR TISSUE PATHOLOGY IN THE ARMY

General. 1. Laboratories with selected personnel and the necessary equipment facilities are to be designated as "histopathologic centers." These centers will forward to the Army Institute of Pathology, Army Medical Museum, Washington 25, D. C., all completed autopsy and such surgical material as have possible administrative or "follow-up" value, particularly tumors and those specimens requiring final or confirmatory diagnosis. Facilities for consultation in all fields of pathology have been established by the Army Medical Museum.

2. In oversea theaters of operations, theater surgeons are requested to designate the general medical laboratory of the theater as the histopathologic center, or, if there is none, to designate one or more suitable medical laboratories as their histopathologic centers. The Director, Army Medical Museum, Washington 25, D. C., should be informed promptly of the A.P.O. address of the designated centers. The laboratory officers of such designated centers will forward suitable pathologic material, accompanied by the proper data, direct to the Army Medical Museum. Medical officers stationed overseas are urged to send to the Army Medical Museum pathologic material from diseases encountered, inasmuch as "geographic pathology" has become of great importance to the armed forces. Many officers have an opportunity to render distinctive services by obtaining and forwarding such pathologic material, as well as insect species that act as disease vectors or are suspected of doing so, poisonous plants, poisonous snakes, and other material of medicomilitary interest.

3. Letters of transmittal are not desired. All information should be in the protocol or an M.D. Form 55M. Army Regulations 40-410 authorizes direct correspondence between the Director, Army Institute of Pathology, Army Medical Museum, the histopathologic centers, and the chiefs of hospital laboratory services.

Descriptions for preparation of histopathologic materials. This information is included in AR 40-310, AR 410, TM 8-227, and standard book No. B200070, The Autopsy. It is important to emphasize certain points.

1. "Rush" reports. If there is need for an immediate report, as when board proceedings are dependent on the autopsy findings, the case should be marked "rush," in which instance the histopathologic center will expedite the rendering of the completed autopsy report. Radio reports on autopsy or surgical tissue will be made on request.

2. Shipping of tissue specimens. For mailing small fragments of tissue, the double mailing case (Item No. 41270000) is adequate. The wide-mouth bottle (Item No. 4059000) will prove satisfactory, as it will fit in the mailing case. For protection it should be carefully packed in absorbent cotton. The labels should be marked "First Class Mail, Rush, Specimen for Diagnosis." Shipments exceeding 4 pounds in weight will be made by express by the local quartermaster, or, if under 70 pounds and less than 100 inches in

---

Abstract of TB MED 19, 11 March 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

length and girth combined, may be mailed at parcel-post rates, but not franked. Cloth tags dipped in hot paraffin *after* marking should be used to label wet specimens.

3. Transmittal of tissue with patients transferred to another hospital. Duplicate slides of surgical specimens or the corresponding paraffin blocks will accompany the clinical records of patients being transferred to another hospital when the pathology has direct bearing on the diagnosis and treatment. This provision is of special importance in cases transferred from oversea hospitals to those in the United States. Medical officers responsible for the further care of patients may thus avoid additional biopsies, and proper treatment may be instituted more promptly.

4. Tissue specimens offering technical difficulties in sectioning. Specimens presenting technical difficulties in histologic preparation may be forwarded by the most expeditious route direct to the Army Medical Museum and, if necessary, a radio report requested. Such specimens include eyes (unopened and unsectioned), bone, bone marrow, and certain skin specimens, to be forwarded in suitable quantities of neutral 10 percent formalin solution in preference to any other fixative.

5. Material and data are particularly desired from (1) those who have had atabrine, (2) those who have had jaundice, (3) those who have been exposed to high altitudes (temporal bones, endocrine glands, etc.), (4) those who have died of burns or crushing injuries, (5) those who have been exposed to cold through immersion or high altitude, and (6) those who have been exposed to blasts.

FUNCTION AND SCOPE OF MEDICAL DEPARTMENT LABORATORIES

TB MED 135 was written as a guide to outline in summary form the variety of examinations different types of Medical Department laboratories should be prepared to perform. The scope of any given laboratory will depend on the functions of the unit of which it is a part, and on the accessibility of other and more complete laboratory installations. A table is included which, assuming "normal" conditions of operation, defines the variety of procedures various types of laboratories will perform. If conditions are not "normal," it may be necessary to increase the functions of particular units by appropriate theater authorizations.

Medical general laboratories will be able to perform, in addition to all the common tests, procedures in toxicology, food and water chemistry, virology, and rickettsial disease study, food bacteriology, and *Streptococcus*, *Shigella*, and *Salmonella* serologic typing. The laboratory, army, on the other hand, will be expected to perform the special procedures listed above only when by reason of inaccessibility it is impractical to handle specimens in the medical general laboratory.

Hospital laboratories are authorized and equipped to perform the usual clinical procedures in urinalysis, hematology, bacteriology, chemistry, serology, and parasitology. These are enumerated more fully in the table included in TB MED 135.

EMERGENCY FEEDING OF SPECIAL GROUPS OF CIVIL POPULATIONS.

The purpose of TB MED 53, 12 June 1944, is to provide technical information pertaining to nutrition which would assist medical and other interested officers in planning and supervising the feeding of certain civilian population groups under emergency conditions.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Suggested methods for distribution of foods, instructions for preparation and storage of various food items, basic diets for infants and children and pregnant and nursing mothers, and methods for utilizing combat rations in the feeding of infants and children are listed. Information as to use of various foods in feeding the starved and general information pertaining to sanitation in a unit from which food is to be served are also included.

While this bulletin was written primarily to meet the needs of special groups of the populations in certain European countries, portions of the information would be applicable to Far Eastern areas.

CAD UNITS FOR THE FAR EAST

Medical and sanitary supplies for caring for medically destitute civilian populations in Allied occupied territory have been gathered together in convenient units called CAD units. TB MED 149, 17 March 1945, is a list of drugs and chemicals in these units, giving a description of their properties and common usage. The descriptions are brief, so that they may be readily translated into whatever tongue may be necessary for the use of native civilian physicians. The units are as follows:

Basic Medical Unit. Contains basic drugs, dressings, surgical instruments, accessories, and confinement supplies.

Hospital Units. Contain complete equipment for 10-, 40,- and 200-bed hospitals.

Obstetrical Bag. Hand portable kit containing basic obstetrical supplies for the use of native trained midwives.

General Dispensary. Contents same as for 10-bed hospital, without the beds.

Biological Reserves. A central reserve of biologicals to be used for the control of epidemics.

Antimalaria Drug Unit. Contains drugs for the treatment of malaria.

Antimalaria Equipment Unit. Contains sprayers and accessory equipment for malaria control.

Antimalaria Supply Unit. Contains insecticide, repellent, and oil for use with the Antimalaria Equipment Unit.

Malaria Survey Laboratory Unit. For performing malarial surveys.

Antityphus Unit. Contains dusters, DDT, vaccine, and other supplies for the control of typhus.

Dental Equipment Unit. Is made up of a complete dental chest, No. 60

Dental Supply Unit. Contains supplies for use with the Dental Equipment Unit.

X-ray Equipment Unit. Contains equipment for taking and processing x-rays.

X-ray Supply Unit. Contains expendable x-ray supplies.

Sanitation Equipment Unit. Consists mainly of water-purification equipment to furnish an emergency supply of potable water until such time as existing utilities can be repaired.

Sanitation Supply Unit. Contains water purification supplies for use in connection with the Sanitation Equipment Unit.

Basic Laboratory Unit. Consists of laboratory equipment and supplies for use in epidemic studies and laboratory diagnosis of diseases. Technical Manual 8-227, "Methods for Laboratory Technicians," a detailed laboratory guide, is included in the unit.

Veterinary Biological Reserves. Contains vaccines, serums, and diagnostics for the prevention and treatment of epidemic-type animal diseases.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Basic Veterinary Unit. Contains basic essential drugs and dressings for the prevention and treatment of animal diseases.

Veterinary Surgical Unit. Contains basic instruments for the surgical treatment of animals.

Rodent Control Unit. Contains rodenticide and traps.

SANITARY CONTROL OF SWIMMING POOLS AND SWIMMING AREAS

The Medical Department exercises sanitary supervision over Army swimming pools and swimming areas. The construction of pools and the operation of equipment is a function of the Corps of Engineers. The control of swimmers is a responsibility of the commanding officer. The sanitary supervision of pools and areas includes inspection of operation, laboratory examinations of the bathing waters, recommendations regarding construction and location, and sanitary surveys.

The more common infections attributed to swimming are sinusitis, otitis media, and conjunctivitis. Intestinal disorders are rarely contracted from swimming. In endemic areas, schistosomiasis may be acquired by bathing in infested waters. Where disease is being transmitted through swimming facilities, the pool or area should be closed at once and until corrective measures are established.

Routine inspections should be made, giving attention to the supervision of the bathers, the cleanliness of the bathing facilities, and the quality of the water. Free chlorine at a concentration of from 0.4 to 0.6 p.p.m. should be maintained in swimming pool waters during periods of use. The water should have a pH between 7.2 and 7.6. During the inspection the operating records should be reviewed and the enforcement of regulations should be noted. It is desirable to collect samples for laboratory examinations at least weekly. None of the five 10-ml. portions of the water examined should be positive for coliform organisms and not more than 15 percent of the samples should contain more than 200 colonies per milliliter when incubated twenty-four hours at 37° C. on standard agar.

Beaches and other natural swimming places should not be located in proximity to sewer outlets. In some instances where snails which may be infested with schistosome parasites are present, copper carbonate may be used to kill them. In determining the safety of water at natural swimming areas, emphasis is laid on the results of sanitary surveys rather than on bacteriologic examinations. As a guide in determining the suitability of natural water for bathing, a classification is given based on the presence of *Esch. coli.* The facilities at swimming pools and beaches are described, including dressing rooms, showers, toilets, sewerage, and water supply. (TB MED 163, May 1945)

TAKING OF BLOOD SPECIMENS

There is danger of spreading infections, particularly infectious hepatitis, when a large number of successive bleedings are to be performed, employing unsterile syringes. The following are approved procedures: (1) Use of a sterile needle only, to which is attached a short piece of rubber tubing to facilitate delivery of the blood into the test tube. (2) Needles and syringes (if employed) are preferably sterilized by dry heat and in any event should be free of water when used. (3) See paragraphs 40 and 97, TM 8-227. (TB MED 78, 4 Aug. 1944)

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Vol. IV
No. 3

NEUROPSYCHIATRY

NEUROPSYCHIATRY FOR THE GENERAL MEDICAL OFFICER

Every medical officer, regardless of his assignment, is confronted with both major and minor psychiatric problems. It is expected that he will have to assume responsibility for the treatment of the great majority of the minor adjustment problems of the soldiers. On the basis that many medical officers have had inadequate orientation in the field of psychiatry, TB MED 94, 21 September 1944, presents simple and basic fundamentals of psychiatric practice.

Colonel William C. Menninger, M.C., director, Neuropsychiatry Consultants Division, The Surgeon General's Office.

Not only does the Army have the responsibility for providing treatment for those of its members who break down as a result of considerable stress, but it is confronted with the large number of individuals who have always maintained a marginal adjustment and break down under minor stress. It is imperative that every soldier who can be salvaged should be provided that assistance which will enable him to function. The medical officer will be confronted with various types of personality disorders: (1) the strictly organic conditions in which the emotional difficulties may be an important factor in the recovery. As an example, this is particularly conspicuous in men who have had wounds and develop some degree of anxiety as their wounds heal and as they are confronted with the prospect of return to further combat duty; (2) the very common psychogenic somatic disorders, including gastrointestinal, cardiovascular, and orthopedic complaints; (3) predominantly psychic syndromes expressed in the symptoms of anxiety, fear, obsessions, conversions; (4) the group labeled "psychopaths," the misbehavers; (5) the transient emotional episodes related to great stress, as in combat, or to prolonged minor stresses which are termed situational maladjustments; (6) the attitude problems which from the military point of view cannot be regarded as sickness. This includes the group who do not want to do duty, who feel they have "done their share." This last group represents administrative problems, not medical.

The causes of mismanagement, including the medical officers' attitudes toward these problems, are frankly presented, including the all too frequent indifference on the part of the medical officer to emotional problems or his tendency to belittle or even denounce the patient. These basic causes of mismanagement are summarized under the general headings of the lack of educational training in psychiatry, the emotional attitude of some physicians toward psychiatric problems, the relative intangibilities of the sub-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ject, the time consumption required in both diagnosis and treatment, the failure of some medical officers to evaluate their function in the Army, and the lack of experience.

The more common errors in psychiatric practice in the Army are detailed. These include the failure to assess the emotional factors in the illness, arriving at a diagnosis by exclusion, failure to take an adequate history, inability of some medical officers to develop rapport with the patient with an interest in him rather than his disease, the tendency toward overexamination and overhospitalization, making of ill-advised statements or promises to patients, failure of various specialists to work as a team, and, finally, the practice of being unduly influenced by statistics.

The bulletin outlines numerous misconceptions regarding psychiatry often held by intelligent people, including medical officers. These include failure to recognize that neurotic reactions may often occur in "normal" people and that pure malingering is relatively uncommon. Many physicians do not recognize the fact that patients with neurotic and psychotic illnesses do usually get well. It is often assumed that mental illnesses are merely graduations of each other, although, in fact, there are many distinct types requiring very different treatment. Too often it is assumed that the neurotic soldier can be forced or scolded into being an effective fighter, and on the other hand, it is not recognized that soldiers with neurotic reactions may even be good combat soldiers.

Basic concepts in psychiatry are presented, including the meaning of the term "normalcy," the concept of "conflict," and, finally, the "total response" concept, which is used to indicate that in all illness the individual reacts as a total unit—physically, chemically, and psychologically—to his environmental demands. The important modifying factors in the choice of "fight or flight" reaction include constitution, early environmental training and development, and the precipitating factors.

The psychiatric approach as it applies to the physician-patient relationship is discussed in some detail with special attention given to obtaining a psychiatric history. In addition, a brief outline of a psychiatric examination is presented, covering the fields of general reaction, perception, intellection, emotion, and behavior.

In the practice of psychiatry in the Army hospital, early consultation should be carried out jointly by the ward officer requesting such and the psychiatrist. The patient needs to be prepared in most instances for neuropsychiatric consultation. Joint staff rounds, particularly between medicine and psychiatry, have been found extremely helpful.

Within the Army structure certain psychiatric problems develop which have much more specificity and importance in the Army than in civilian life. These special types of problems include the so-called "gold bricks" in whom some physicians often fail to recognize the extent and degree of maladjustment. Psychoneurotic responses are numerous and in such individuals improper therapy often produces chronic, lifelong invalidism, whereas proper therapy may transform an ineffective neurotic patient into an efficient, well soldier. Malingering occasionally occurs, and the medical officer is often called upon to differentiate between malingering and illness. The so-called psychosomatic illnesses are frequent, particularly the gastrointestinal, cardiovascular, and orthopedic types. So far as the medical officer is equipped to do so, he should manage such cases. Certain surgical patients present special psychiatric problems, especially those with a neurotic make-up with preoperative anxiety and postoperative complaint, and some amputees and plastic cases.

Finally, the principles of psychiatric treatment are outlined, and various types of psychotherapy are described. Of most importance are early and prompt treatment and alleviation of the symptoms. S.G.O. Circular Letter

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

No. 176, 20 October 1943, dealing with the treatment of neuropsychiatric conditions in combat zones, is still applicable, although a revised bulletin on this subject is in preparation. Special emphasis is placed on the indications for hospital treatment, pointing out that neurotic patients may often be made worse by routine hospitalization. Furthermore, patients with psychoneurotic illnesses, including the so-called "organ neuroses" (gastrointestinal, cardiovascular), are made worse if merely kept on a hospital ward with no schedule of activities. The physician's therapeutic responsibility at the time of discharge is pointed out, including the point that he must present and explain to the patient the nature of his type of illness and advise him regarding his postdischarge status and medical needs.

TREATMENT PROGRAM FOR PSYCHIATRIC PATIENTS IN STATION AND GENERAL HOSPITALS

That maximum hospital benefit will be provided for all neuropsychiatric patients except those with "chronic psychoses or chronic degenerative neurological disease" is specifically directed in Change 2 of AR 615-361, dated 1 March 1945. Even these cases will, however, "receive appropriate treatment while awaiting disposition." The treatment program of psychiatric patients in station and general hospitals is outlined in detail in TB MED 84, 10 August 1944. This bulletin is supplemented by the treatment program in convalescent hospitals outlined in TB MED 80, 3 August 1924.

The import of TB MED 84 is to indicate that, in spite of shortages of personnel, all psychiatric patients in all types of hospitals are to have the best psychiatric treatment. The aim is to salvage every possible soldier for further duty and to give the benefit of treatment to those who cannot be salvaged. The fact that the man has a neuropsychiatric illness and is admitted to the neuropsychiatric section of a hospital should in no degree change the aim of the Medical Department toward returning the man to duty if he is capable of duty. This bulletin outlines the desirable physical arrangements, personnel, and equipment.

With regard to physical arrangements, psychotic and psychoneurotic patients should not be housed in the same ward. Prisoners, unless neuropsychiatric cases themselves, are not to be housed with neuropsychiatric patients, and armed guards should not be permitted on a neuropsychiatric ward. Psychoneurotic patients should be housed in unbarred, open wards. In the convalescent hospitals patients are housed in barracks. The use of barracks in other hospitals for mildly ill neuropsychiatric patients is desirable.

In regard to personnel, a desirable ratio of psychiatrists to patients is 1 to 35. There should not be a ratio of less than 1 psychiatrist for 50 patients. Nurses with psychiatric training should be used as much as possible. As authorized in Circular No. 71, War Department, 6 March 1945, a commissioned clinical psychologist may be assigned to the neuropsychiatric section of each hospital of 1,000 beds or more. Skilled and/or semiskilled psychiatric social workers should be assigned on a ratio of two for each psychiatrist. Use may be made of WACs. Full use should be made of the Red Cross personnel, gray ladies, and of the orientation and special service officers. A continuous course of instruction should be provided for all personnel working with neuropsychiatric patients. On large services, a Medical Administrative Corps officer is of great help.

The equipment and facilities necessary for effective treatment include provision for adequate occupational and recreational activities. The treatment program should include psychotherapy, both individual and group, and this feature is regarded as the most essential part of the entire thera-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

peutic program. In addition, there should be a planned and scheduled program for every patient who can possibly participate in such, including occupational, recreational, educational, and vocational activities. In addition, provision should be made to include in such a program those military activities that are appropriate and individual and group activity in art, music, and dramatics.

Special treatments when indicated are to be provided. Shock therapy, utilizing insulin, metrazol, and/or electro-shock, is approved for the psychoses at designated psychiatric centers, and under adequate precaution should be utilized to the fullest degree when indicated. Psychotherapy under sedation (pentothal or amytal) should be provided when indicated, and it is believed that in some instances, under experienced hands, hypnosis may be used efficaciously. Various types of hydrotherapy, including prolonged immersion, baths, and cold wet sheet packs, should be utilized. Drug and dietary therapies are to be used when indicated.

Special attention should be given to the psychoses, and it is desired that maximum treatment benefit be given to those cases in which there is a reasonable hope of recovery in a relatively short period. A high percentage of the psychotic group can be sufficiently readjusted to permit them to be sent home rather than to Veterans' installations, and every effort should be made to accomplish this end. Certain individuals who have completely recovered from an acute transient psychosis, which was precipitated by very stressful situations, can be returned to duty for limited assignment.

This technical bulletin outlines briefly the treatment for outpatients, on the assumption that a great majority of the psychiatric patients must be handled on an outpatient basis and no patient should be sent to the hospital who can be treated as an outpatient.

Finally, the psychiatrist has a special therapeutic responsibility at the time of discharge in instructing the patient relative to his further medical needs, in explaining the nature of his illness, and in giving instructions as to what he should and can do about it after discharge. Where desirable, the psychiatrist should enlist the assistance of the social workers of the Red Cross so that they may, if necessary, communicate with his home. A booklet is now in preparation which the medical officer is expected to give to each psychoneurotic patient about to be discharged, which attempts to explain to the patient the nature of his illness. This booklet is, however, only supplemental and is in no way a substitute for the physician's responsibility in this direction.

RECONDITIONING PROGRAM FOR NEUROPSYCHIATRIC PATIENTS

Because of the military situation, men too ill to perform duty are hospitalized. There is no other alternative. This practice has resulted in the hospitalization of many individuals with psychoneuroses who in civilian life would have been treated on an outpatient basis. This practice also, in many instances, encouraged fixation of symptoms, increased concern about functional ailments, and contributed to the development of apathy.

The shortage of beds and of psychiatrically trained personnel acted as a stimulus to the development of the present convalescent hospital treatment program for psychoneuroses which do not require intensive individual treatment and which do not require general hospital care. The program was planned to avoid the ill effects that the usual type of hospital treatment entailed for this type of patient. At least one A.S.F. convalescent hos-

Abstract of TB MED 80, 3 Aug. 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

pital was established in each service command. There are now twelve: Welch Convalescent Hospital, Florida; Mitchell Convalescent Hospital, California; Camp Edwards Convalescent Hospital, Massachusetts; Camp Upton Convalescent Hospital, New York; Fort Story Convalescent Hospital, Virginia; Camp Pickett Convalescent Hospital, Virginia; Camp Butner Convalescent Hospital, North Carolina; Wakeman Convalescent Hospital, Indiana; Percy Jones Convalescent Hospital, Michigan; Brooke Convalescent Hospital, Texas; Camp Carson Convalescent Hospital, Colorado; and Madigan Convalescent Hospital, Washington. Originally planned for both overseas and zone-of-interior patients, the general hospital bed situation necessitated the use of these centers predominantly for cases returning from overseas.

In practice, all neuropsychiatric cases are rapidly screened at the debarkation hospitals. The sicker individuals, those who require general hospital care and those who require intensive individual therapy, are transferred to one of twenty-nine general hospitals which have been designated as psychiatric centers. The milder cases which, to a very great extent, consist of the less serious psychoneuroses are transferred to the convalescent hospitals.

The convalescent hospital has three divisions:

1. *The Receiving Division* is where all new patients are admitted and examined to determine whether or not they are too ill to be admitted to the treatment program. Prompt attention is given to straightening out matters of pay and clothing. Necessary medical work-up is completed. Interests and skills of the patients are explored and the determination made as to the activities in the education program in which they will partake. More detailed medical and social histories are obtained, and assignment to one of the companies in the convalescent hospital is made if the patient is found suitable. All of the above is completed in the matter of several days, following which the patient is given a sick furlough which may vary from fourteen to thirty days.

2. *The Infirmary Division* consists of a hospital in the usual sense of the word. Patients who are too ill to be admitted to the reconditioning program or those who develop intercurrent illnesses while partaking of the program are admitted here for treatment or as a temporary measure prior to transfer to a general hospital. In those instances where the convalescent hospital adjoins a general or regional hospital, this latter installation also acts as the Infirmary Division of the convalescent hospital.

3. *The Reconditioning Section* or, in the case of the NP patient, the Neuropsychiatric Treatment Section, where the patients are organized into companies, battalions, and regiments. The men are housed in reconditioned barracks and are maintained in uniform. The commanding officer of the NP battalion is a psychiatrist. He is assisted by a psychiatrist assigned to each company of about one hundred men. Medical Administrative Corps or Branch Immaterial officers act as commanding officers of the companies. Two male enlisted psychiatric social workers are assigned to each company with a status of noncommissioned officer. Clinical psychologists are assigned in a ratio of one to every two hundred patients. Company clerks, "noncoms," and administrative assistants to the battalion commanders are also provided. The neuropsychiatric battalion or battalions represent just one part of the reconditioning division. In all cases, the neuropsychiatric treatment program is part of and coordinated with the total reconditioning program for all types of patients. The objective of the program is to salvage as many men as possible for further duty, whether it be general or limited assignment, and to get in the best possible condition patients who are to be discharged from the service.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Patients enter the neuropsychiatric treatment section upon return from their sick furloughs. As a rule, they are maintained in a program for a period of six to eight weeks.

All patients newly admitted to the reconditioning section receive an orientation talk as soon as possible after arrival. The purpose of the program and its content are outlined, and opportunities to ask questions are offered. Men are told that they will not be expected to perform to the limit of their capacities. No promises concerning their future disposition are made, but it is made clear that recommendation for assignment upon return to duty will so far as possible be consistent with the individual's skills and mental and physical capabilities. Policies concerning furloughs and passes are frankly stated. It is necessary to impress the patients with the fact that the planned program is a form of treatment and that they have a share in the responsibility for getting well and that rigid adherence to the schedule is enforced. Military discipline is maintained at a moderated level.

Experience has shown that a compulsory full-time program with provisions for some elective activities is productive of the best results. The program constitutes the treatment and is carried out with the approval of the chief of neuropsychiatry and with the assistance of the psychiatrists assigned to the program, under the direction of the chief of reconditioning.

The program includes the following activities:

1. *Individual psychotherapy.* While this is the most important form of psychiatric treatment, the shortage of trained personnel and the limitations of time do not permit it to be used as a routine measure. Individual approaches are used whenever indicated, and in such cases it takes preference over the remainder of the program. While the working through of unconscious problems forms the basis for the most satisfactory type of recovery, it is expected that it will not be possible to do more than assist patients in gaining relatively superficial insight. It is understood that the program itself and the group method of handling men do not involve disregard of the individual and his problems.

2. *Group therapy.* This has been found to be a practical approach to the psychiatric treatment of the large numbers of patients who must be handled by the few available psychiatrists. Group treatment is given from three to five times a week. Ten to thirty men constitute a group. Technique consists of either lectures or group discussions on common problems or a combination of both. While this part of the program is primarily the concern of the psychiatrist, in many instances enlisted psychiatric social workers and psychologists have been of great assistance.

3. *Occupational therapy.* Occupational therapy has a more important place in the reconditioning program for psychiatric groups than for most other patient groups. Therapists are graduates of graduate schools of occupational therapy and are familiar with the problems of emotional and mental disorders. They are assisted by those with arts and crafts or manual arts training. The occupational therapy program is in some places coordinated with the educational program. Elaborate shops have been provided which permit a wide choice of activities. Completely equipped shops for auto mechanics, welding, woodwork, crafts, arts, sculpturing, music, photography, printing, and electrical experiments are provided. Trained instructors have been made available. A free choice of activity is given the patient. Their interests may serve to indicate the direction for future assignment recommendations or interests may be developed which will be carried over into civilian life after discharge. The occupational therapy program is supplemented by arts and skills activities which are organized and supervised by American Red Cross personnel. Elective classes are given in oil and water-color painting, pencil and charcoal sketching, weaving, wood carving, leather work, art metal work, and hobby activities.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

4. *Educational program.* Lack of proper motivation and orientation toward the war are often significant factors in the etiology of psychiatric disorders. Since surveys on neuropsychiatric casualties overseas indicate the evident need for emphasis on orientation which is lacking in many of the men, orientation hours are held daily in most places. The time may be used for discussions on current events and on problems arising out of the war. Lectures on timely topics by invited guest speakers are frequently given, and appropriate films may be shown.

Participation in U. S. Armed Forces Institute courses is encouraged. Academic courses of various kinds are provided for those who are interested in such instruction. Graduates of the I & E school for educational reconditioning are used as instructors.

5. *Physical reconditioning and recreation.* These two phases of the program are generally coordinated so that a well-rounded program of calisthenics and participation in sports of all types is provided. Facilities for baseball, volleyball, tennis, swimming, bowling, basketball, badminton, etc., have been provided. The program ordinarily entails daily participation in one of these activities, which is supervised by a trained physical reconditioning officer.

Some delays have been encountered in the organization and development of the reconditioning program in convalescent hospitals. Difficulties in obtaining necessary equipment and personnel have at times interfered. However, for the most part, the programs are now running more smoothly, and they represent a great advance toward the goal of rendering adequate treatment to the psychiatric war casualties.

GROUP PSYCHOTHERAPY

With the change in policy regarding neuropsychiatric patients from one of diagnosis and rapid disposition to one which permitted and encouraged definitive treatment, it became necessary to adopt techniques which would permit the relatively inadequate numbers of psychiatrically trained personnel to handle the large load of patients under their care. Valuable as recreational and occupational therapy activities are, they are not themselves sufficient to meet fully the problem of rehabilitating the psychiatric casualty. Experience with group psychotherapy has been sufficiently successful to warrant its recommendation for use in the Army as a partial solution to the problem of rendering more adequate treatment to the psychiatric casualty.

The type of therapy that can be accomplished in groups will necessarily be more superficial than that which can be accomplished by individual therapy. It is nonspecific in character and cannot be expected to accomplish that which intensive individual therapy can do. However, many of the patients with psychoneuroses have common problems and complaints. These can be approached and treated effectively in a group setting. The mechanism of development of somatic symptoms from psychogenic causes can be presented and discussed. Matters related to defective attitudes and feelings of hostility (toward Army) and of guilt can be turned back to the group for analysis and discussion. Concern about the diagnosis of psychoneurosis, fears related to psychiatric illness, and relationships with civilians and families are some of the other problems that are of common interest. Contrary to what might be expected, group therapy offers a medium for some to express themselves more freely. Personal problems are minimized and

---

Abstract of TB MED 103, 10 Oct. 1944.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

seen in a broader perspective. Guilt feelings concerning failure and incapacity without visible or organic disease to justify such failures are partially relieved in the recognition that others have similar disorders. The individual problem is partially transformed into a group problem. Where individual therapy is necessary, it can and should be given in addition to the group treatment.

One of the most important motivating factors which keeps men going in combat despite all hardships and danger is the identification with their units. Once removed from their organizations and returned to the zone of the interior, this factor is removed. Participation in a group for treatment in small part corrects this deficiency, especially if group spirit and consciousness is fostered with the objective being return to duty. It is important that each soldier have a feeling of "belonging, Where this consideration is ignored, efforts at resocialization will be poor or ineffectual.

Feelings of insecurity so often seen in the patients improve with the recognition that others too have psychoneurotic disorders. Airing symptoms in a group sitting demonstrates the universality of individual problems and relieves feelings of isolation. The need to solve the problem is stimulated by reason of the inability to conceal the problem from society any longer. A patient's attitude toward his experiences may be greatly influenced when he observes that the group reaction to them is different from his own. Individual attempts to gain the approval of the therapist become manifest, and opportunity for public praise and encouragement is offered.

The most common objections to group therapy are: (1) Patient may get out of and beyond the control of the therapist when permitted to talk without restraint or fear of punishment. (2) The knowledge that others have similar disorders will remove guilt feelings and make it more difficult to remove symptoms and return patients to duty. (3) The fear that neurotic individuals will acquire new symptoms by suggestion from other patients. While these objections are valid, they do not outweigh the advantages. Furthermore, a skilled therapist can maintain control of a group which is permitted free expression, and acceptance of illness can be combated by rekindling positive feelings of patriotism and a desire to get well.

Group psychotherapy can be used in any setting where numbers of individuals with personality difficulties and emotional adjustment or neurotic disorders are present. It can be used in the neuropsychiatric sections of hospitals and reconditioning facilities, in mental hygiene units, in consultation services, in rehabilitation centers, and in tactical organizations.

Various methods and techniques have been used in conducting group treatment. The success of any one method depends upon the skill, enthusiasm, and personality of the therapist. A combination of lectures and discussions is most commonly used. Sessions are ordinarily held from three to six times a week, averaging forty-five minutes to an hour.

The repetitive nature of symptoms and the immature and unrealistic method of meeting stressful situations may be pointed out repeatedly. The mechanism of psychosomatic disorders and the role of fear and of expressed and unexpressed aggression can be discussed at great length. The need for dependency and the mechanism of gain from illness may be illustrated. In the military setting, there are factors which interfere with the wish to get well, and considerable attention must be given to the factor of motivation. The favorable response of patients to comparatively brief treatment in groups warrants widespread adoption of this method of therapy. When patients are treated promptly, many can be salvaged for useful military service. It should be remembered that group psychotherapy is just one small part of the total treatment program.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

CONSULTATION SERVICE

TB MED 156, June 1945, is the first general directive published on the mental hygiene clinics, known as consultation services. that are now functioning at every Army Ground Forces replacement training center and every Army Service Forces training center. It lists as the functions of the consultation services the prevention of mental disorder, the adjustment and treatment of the maladjusted trainees, and the recommendation of appropriate disposition of men incapable of receiving training. It then discusses the specific functions of each group of personnel that composes the clinic staff—the psychiatrist, the commissioned clinical psychologist, the Red Cross social worker, the military social worker, and the clerical assistants. This TB MED treats in detail the operational methods of the consultation services—e. g., sources and reasons for case referral, psychological examinations, social case histories, the psychiatric examination, treatment methods, disposition of cases, and the size of the clinic staff. In keeping with recent directives, particularly War Department Circular No. 81, it stresses the preventive aspect of Army psychiatry and the great role played by motivation. The psychiatrist who conducts the consultation service is to function as a staff officer, advising his command on matters of mental health, discipline, and morale.

DISPOSITION OF NONEFFECTIVE PERSONNEL

A policy which is fundamental not only to neuropsychiatrists, but to all medical and line officers in the Army, is set forth in War Department Circular No. 81, 1945, section III. It concerns the disposition of noneffective personnel and emphasizes that medical channels for evacuation, reclassification, and discharge are to be used only for the disposition of individuals who are sick or injured. Noneffectives who are not disabled are to be disposed of by command through nonmedical channels.

Medical disability, whether from sickness or injury, is only one cause for noneffectiveness. There are other causes: lack of training, lack of intelligence or physical stamina, emotional instability, improper attitudes, and unwillingness to expend effort. During this war and probably in previous wars, there has been a powerful tendency to disregard these other causes and to attribute all noneffectiveness to medical disability. For example, noneffectiveness has been attributed to coexistent medical defects such as flatfoot, lumbosacral strain, or mild psychoneurosis, when actually these defects were not in themselves significantly disabling and the primary cause of the noneffectiveness was nonmedical (inaptness, improper attitudes, etc.). Circular No. 81 points out that a medical defect does not in itself constitute adequate cause for medical discharge unless the defect itself is genuinely disabling for military service. In reaching a decision as to the disposition of a patient, many medical officers have evaluated the individual not in terms of what he could do, but in terms of what they thought he was likely to do. If the man was willing to do merely his share in the war effort and would obviously not be of much use to his unit, many medical officers (at times as a result of pressure exerted by the line) have taken on themselves the responsibility for removing the man from the service, by attaching a medical diagnosis which was not completely justified by the actual type or degree of clinical finding in order to effect the desired disposition. This practice has occurred in hospital dispositions, in rejecting men for overseas service, and in evacuating men from combat. It has resulted in unnecessary loss of manpower, has in certain instances seriously undermined morale, and has actually served to cause psychiatric disorders.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

The reason morale is undermined by undue leniency in disposing of noneffectives through medical channels is not altogether clear. It probably is related to the fact that a medical disability is regarded as honorable and exonerates the individual from any stigma for having been noneffective. In combat, the thing that keeps men fighting and on the job is their self-respect, and there are many men who long for "a thousand dollar wound," which will not be seriously incapacitating and yet provide them with an honorable release from danger and hardship. Consequently, when an individual who is not truly sick or injured, but merely unwilling or incompetent, becomes medically evacuated to safety and comfort in the rear, the rest of the men in the unit feel resentful and discouraged.

Causes for undue leniency in medical disposition are many. When a unit commander encounters a soldier who is noneffective, difficult to train, or difficult to fit into the unit, it is easier for him to believe that the soldier's noneffectiveness is due to sickness rather than to unsuccessful leadership. If he can have the man removed from his unit through medical channels, no discredit is reflected on his ability as a leader, whereas if the man is returned from the hospital as not being sick, then he remains a challenge to leadership. Therefore, he tends to assert a great deal of pressure on the Medical Department to label the man as medically unfit for service and to dispose of him on that basis. On the other hand, the unit commander may recognize perfectly well that the man is not sick but merely too deficient in intelligence or personality ever to become an effective soldier. However, to dispose of him through administrative channels by AR 615-368 or 615-369 has been difficult. Paper work is involved, board meetings take up time, and board recommendations have frequently been disapproved by reviewing authorities at higher echelons. Medical disposition, on the other hand, requires little time on the line officer's part. He merely refers the man to the Medical Department, and the man is out of the unit and off his hands. He therefore may persistently try to use medical channels for these cases. It has not been uncommon for officers to approach medical officers and frankly request the latter to find some way of taking a certain soldier off his hands because of the difficulty in making a prompt administrative disposition.

Circular No. 81 is intended to discourage this practice. Medical officers are directed that when after careful medical evaluation, including psychiatric examination, it is the medical officer's opinion that the individual has a condition which warrants consideration for discharge under provision of AR 615-368 or AR 615-369 and no condition is present which warrants discharge for medical disability, a certificate to this effect will be forwarded by the psychiatrist to the individual's commanding officer through medical channels. This certificate will include a statement specifying and describing the nonmedical conditions in detail. Coexisting medical disabilities which do not warrant medical discharge will not be mentioned. It is further directed that in such cases the appropriate commander will convene promptly the board of officers required under the appropriate regulation. Only experienced, qualified personnel will be appointed to such boards. Commanding officers will make available to these boards such administrative assistance as is necessary.

When an officer has demonstrated inadaptability to his assignment and his psychiatric or physical condition is not such as to warrant placing him before an Army retiring board, prompt measures will be taken to initiate reassignment or reclassification under AR 605-230.

Another reason for the abuse of medical channels is a widespread prejudice concerning psychoneurosis. Although it was amply demonstrated in the last war, as well as this war, that as high as 70 percent of the men develop-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ing psychoneurosis in combat could be successfully returned to duty to render effective service in spite of psychoneurosis, it was widely believed in the Army that this condition, no matter how slight, rendered a person noneffective and undesirable. Directives were issued tantamount to saying that once a man was diagnosed as being psychoneurotic he must automatically be discharged from the Army, no matter how capable he might be of rendering effective service. Circular No. 81 states it should be clearly recognized that the presence of any type of psychoneurosis should not lead automatically to separation from the service. Many individuals with psychoneurosis recover or, if not fully recovered, are capable of performing full duty. The disposition should depend solely upon the degree of incapacity after adequate treatment. In itself, a mild psychoneurosis of any type cannot be considered adequate cause for disability discharge. When an individual is suffering from a psychoneurosis which is not incapacitating, he will be returned to duty.

The abuse of medical channels is particularly likely to involve the diagnosis of psychoneurosis as opposed to some organic condition such as flatfoot or lumbosacral strain, because of the necessity for relying on subjective rather than objective findings. Circular 81 states that:

"The diagnosis of any type of psychoneurosis implies sickness and disability of some duration. It is not to be applied for reasons of expediency in order to effect a disposition. It will be applied only when its use is justified by the existence of a clinical picture which satisfies the criteria for psychoneurosis as established by good medical practice. The mere presence of psychoneurotic symptoms which do not significantly impair the individual's efficiency or the presence of a predisposition to psychoneurosis does not warrant the diagnosis of any type of a psychoneurosis. Such individuals if otherwise sound will be considered as having no disease.

"The various types of psychoneurosis such as anxiety state, conversion hysteria, etc., are sufficiently well defined to justify their use without being prefaced by the term 'psychoneurosis.' This term will therefore no longer be used on individual clinical records. Instead, the particular type or types of psychoneuroses and the severity will be recorded as the diagnosis. In every case this will be followed by a statement of the degree and nature of the external stress which has precipitated the disorder and an estimate of the extent of the individual's predisposition.

"The terms 'operational fatigue' and 'exhaustion' are acceptable as working diagnoses for psychiatric disorders incurred as a result of combat or other severe stress until a definitive diagnosis has been established.

"The diagnosis of psychoneurosis of any type will not be entered on the WD AGO Form 38 or WD AGO Form 63 of any individual being separated from the service except under AR 615-361 unless the diagnosis has been established by a board of a least three medical officers, one of whom shall be a psychiatrist."

Paragraph 3 of section III, Circular No. 81, concerns prevention of psychiatric disorders and reads as follows: "*Utilization and prevention.* The majority of the factors which determine the mental health of military personnel are functions of command. In other words, the main job of preventive psychiatry must be done by commanding officers of the line. It is a responsibility of command to obtain maximum utilization of manpower by providing proper incentive and motivation, and such reclassification, reassignment, rest, relaxation, and recreation as exigencies of the military service permit. The psychiatrist acts as adviser to the command. In training centers or in Army divisions as a member of the division surgeon's staff, he is to be regarded as having a staff function in advising the command on policies and procedures which affect mental health and morale. In certain divisions and in some commands there appear to be excellent morale and

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

splendid accomplishment which are in part due to an ideal relationship between the psychiatrist, the surgeon, and the responsible officers of the command. It is the responsibility of the psychiatrist to be alert to the situational factors which are precipitating psychiatric disorders and to recommend the measures necessary to alleviate or remove these factors. He should survey the training program from a psychiatric viewpoint, advise concerning schedules, the method of conditioning troops to battle situations, and adjustment to extremes in climate. He should pay close attention to such matters as the furlough policy and the handling of AWOL cases. Through collaboration with the personnel classification officer he should be able to prevent many psychiatric disorders by bringing a medical viewpoint to bear in the job assignment problems. He should be alert to evidence that troops are approaching the limit of their endurance and in need of rest. Equally, he should be alert to untoward effect of boredom from excessive idleness. He should advise other agencies which are important to the morale and mental health of the troops: the information and education officer, the chaplain, the Red Cross, and the special service officer [AG 704.11 (2 Mar. 45)]."

MEDICAL PROBLEMS OF REDEPLOYMENT

A significant psychiatric problem anticipated during the redeployment of troops in the zone of the interior is most likely to manifest itself at the assembly points, while men are receiving retraining, after furloughs. It is recommended that no routine psychiatric screening examinations be done in the zone of the interior, but that men should be examined psychiatrically only on presenting some significant symptomatology. Such examinations should be done in outpatient clinics rather than in hospitals, and every effort should be made to keep such patients off the wards of the hospital and on a duty status.

This bulletin (TB MED 170) points out that troops while awaiting redeployment, particularly those that do not have the best leadership, may also present a real psychiatric problem. It comments on the fact that in the last war psychiatric admission rates reached their peak in Europe after the Armistice. This bulletin emphasizes that defective attitude or a frank disinclination to put forth effort is not in most cases a symptom of a psychiatric disease and must be handled administratively. It is felt that cases occurring in divisional troops should be handled by the divisional psychiatrist since, because of his familiarity with the men and their officers, he is in a much better position to render efficient therapy and to decide appropriate disposition.

METHOD OF RECORDING DIAGNOSIS OF PSYCHONEUROSIS

The use of the unqualified diagnosis of psychoneurosis has proved very unsatisfactory. It is often misunderstood by patients and does not furnish sufficient information on which disposition can be determined; for example, the term "anxiety reaction" does not convey whether the illness occurred in a normal or neurotic individual. It does not indicate the degree or nature of the external stress which produced the reaction and does not reveal the extremely important information as to whether or not the patient is capable of functioning in a useful capacity. As a result of these considerations, War Department Circular No. 81, 1945, stated that the term "psychoneurosis" will no longer be used on individual clinical records. "Instead, the particular type or types of psychoneuroses and the severity will be recorded as the diagnosis. In every case this will be followed by a state-

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ment of the degree and nature of the external stress which has precipitated the disorder and an estimate of the extent of the individual's predisposition."

The diagnosis of psychoneurosis will now be composed of four parts:

1. *The syndrome (or the diagnostic term).* Until further instructions are issued, use will be made of those types of psychoneuroses listed in AR 40-1025 (Anxiety state, Conversion hysteria, etc.) as syndrome diagnosis except for the term Psychoneurosis, mixed type. The severity of the reaction will be described and qualified as either acute or chronic. Example: Anxiety state (or reaction), mild, chronic, manifested by tenseness, loss of appetite, and insomnia.

2. *The external precipitating stress.* Under this heading the external stress is to be evaluated as to type, degree, and duration. The stress will generally refer to the environmental situation, army or otherwise, which is the direct cause of the reaction manifest in the patient. The degree of stress, whether that of combat regimentation, training, or other type, must be evaluated in terms of its effect on the average man in the group rather than on the patient. It should not be presumed that a particular environmental stress is severe because one or even several individuals react poorly to it. Severe stress is such that the average man could be expected to develop disabling psychiatric symptoms when exposed to it.

3. *The predisposition.* The description of the predisposition will consist of two parts: (a) a brief statement of the outstanding personality traits or weaknesses which have resulted from inheritance and development; (b) evaluation of the degree of predisposition based on past history and the personality traits expressed in four grades: "No predisposition evident," "mild," "moderate," and "severe."

4. *Impairment of functional capacity due to the psychoneurotic disability.* The disability represents the degree to which the individual's total functional capacity has been impaired by the psychoneurosis. Disability is not necessarily the same as ineffectiveness and, therefore, the degree of disability should not be determined solely by the degree of ineffectiveness. Effectiveness in any particular job is the resultant of the individual's emotional stability, intellect, physical condition, attitude, training, etc., as well as the degree and type of the psychoneurosis. Disability as used here refers only to the effectiveness resulting from the current psychoneurosis. The degree of disability at the time of the original examination will often vary from the degree of impairment after treatment. Disability at the termination of treatment represents the residual of persistent impairment. It will be recorded as "marked," "moderate," "minimal," or "none." (W.D. Circular No. 179, 16 June 1945)

NEUROPSYCHIATRIC EXAMINATION FOR INDUCTION

As knowledge in the field accumulated, it became apparent that many individuals with minor personality deviations and mild neurotic trends could be of service in the armed forces. TB MED 33, published 21 April 1944, pointed out that the acute need for manpower made imperative the induction of all men who have a reasonable chance of adjusting to the service. The value of a longitudinal study of selectees was stressed, and attention was drawn to the fact that reactions of a hitherto well-adjusted man to the selection procedure were not of themselves disqualifying. The same directive pointed out that often information and time are inadequate to establish accurate diagnoses. In those cases it is directed that, when the selectee is not acceptable, he will be rejected as "not suited for military service," amplified by a descriptive qualification, e.g., "due to severe neurotic symptoms."

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

The same bulletin invited attention to the Medical Survey Program of the Selective Service System which provides medical, social, and educational histories of the registrants. This program thus facilitates the longitudinal study desired.

On 4 June 1945, the War Department published Changes 3 of MR 1-9, Standards of Physical Examination During Mobilization, containing changes in section XXI, Psychiatric Examination. The guide for selection is stated in paragraph 92*a*, as follows: "The object of the psychiatric examination is to procure men who are without psychiatric disorders of such a degree of severity as to make impossible their rendering effective military service."

The longitudinal rather than the brief cross-sectional study is stressed. The diagnosis of psychiatric disorders depends on whether or not an individual possesses qualities or patterns of behavior of such a nature and severity as to have seriously handicapped him in the conduct of his private life and affairs and/or in his interpersonal relationships. The evaluation of such factors in a man is accomplished by psychiatric examination and a knowledge of his past history. The latter may be gathered together from various sources: the man himself, his physicians, the medical survey forms provided by the Selective Service System, hospital and court records, and other social service or welfare agencies. Attention will be given not only to unfavorable or negative data in the history, but also to the favorable or positive data, since a history of good adjustment in the past may be reasonably accepted as favoring a good adjustment in the military service as well. Attention is directed to the fact that often symptoms of anxiety seen by the examiner are due to normal apprehension over domestic or financial matters, the status of which will be determined by the outcome of the examination, and this is not in itself cause for rejection. The change makes borderline intelligence acceptable for general service. Mild chronic psychoneuroses, moderate transient psychoneurotic reactions, and mild mental deficiencies are made acceptable for limited duty.

In evaluating the degree of severity of psychoneurosis, the following factors will be considered: (1) type, severity, and duration of the symptoms existing at the time of the examination and/or in the past; (2) amount of external precipitating stress; (3) predisposition as determined by the basic personality make-up, intelligence, performance, and history of past psychiatric disorders; and (4) impairment of functional capacity.

REVISED NEUROPSYCHIATRIC STANDARDS FOR OVERSEAS SERVICE*

Ordinarily, enlisted men with psychiatric disorder more severe than mild transient psychoneurotic reactions, mild psychopathic personality, or borderline mental deficiency will not be designated as casual replacements for the combat arms. An exception to the above may be made in the case of those individuals who have mild chronic psychoneuroses, moderate transient psychoneurotic reactions, or mild degrees of mental deficiency, when they are performing their assigned duties satisfactorily and the prognosis for continued adjustment is good.

Disqualifying defects (for overseas service) include psychoses or an authenticated history thereof, marked degrees of psychopathic personality, marked mental deficiency, and chronic disabling psychoneurotic disorders. Psychopathic personality and psychoneuroses of mild and moderate severity, or a definite history of such, while not in themselves disqualifying, place

*Extracts from Circular No. 196, War Department, 30 June 1945.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

such individuals in a borderline group. The decision in such cases will be made on the basis of consideration of the following features:

1. Severity or duration of symptoms.
2. Type and degree of external stress precipitating the symptoms (imminence of departure for overseas, domestic difficulties, recent debilitating physical disorders, serious job misassignments).
3. Individual's basic personality strength and nature of previous adjustment and performance.
4. Actual residual impairment of the individual's functional capacity.

LECTURE OUTLINES FOR OFFICERS ON PERSONNEL ADJUSTMENT PROBLEMS

Six hours of lectures on mental hygiene will be presented to all officers (W.D. Circular No. 48, February 1944). TB MED 12 outlines suggestions for subjects to be covered by the psychiatrist in his presentation of this subject.

Lecture No. 1 covers the basic principles of the personality and adjustment, outlining what is meant by personality, "normalcy," and neurotic tendencies. It details the relationships between morale and mental health.

Lecture No. 2 is devoted to the presentation of personality types, and flight and fight responses resulting from the interaction between personality and environment. The basic factors determining the types of response are outlined under the general headings of (1) heredity and constitution, (2) early environment and training, and (3) the precipitating factors.

Lecture No. 3 covers personality structure including both conscious and the unconscious factors that motivate behavior, with definitions of the more common mental mechanisms. It is concluded with the presentation of the mental hygiene principles involved in the conscious motivation of the soldier, including security, gratification, confidence in skill and equipment, and physical condition.

Lecture No. 4 is devoted to the problems of the enlisted man incident to his joining the Army, to his relationship with officers, and to job assignment, rank and promotion, discipline, ideology, fear, and group influences. A brief outline is given of the problems of the noncommissioned and commissioned officers.

Lecture No. 5 is devoted to officers' attitudes towards psychological breakdowns and to a detailed outline of signs and symptoms evidencing maladjustment in the soldier. Presentation is made of signs of mental ill health as evidenced in a group, including the many misconceptions regarding signs and symptoms of mental ill health (in the soldier).

Lecture No. 6 is devoted to the reconstructive possibilities for maintaining morale in the individual and in the group. Throughout the series it is pointed out that the maintenance of mental health is primarily a function of command.

LECTURE OUTLINES FOR ENLISTED MEN ON PERSONAL ADJUSTMENT PROBLEMS

Three lectures on personal adjustment prescribed by War Department Circular No. 48, 3 February 1944, for all new Army trainees during their first ten days in the basic training camp, are outlined in TB MED 21, 15 March 1944. These lectures are to be given by a medical officer, preferably a psychiatrist.

Lecture No. 1 deals with the personal adjustment problems that frequently arise early in the inductee's Army career—e. g., reaction to regimentation and discipline, improper job assignment, and homesickness It

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

also takes up problems that are likely to develop later, such as the reactions to isolation at outlying posts, deprivation of female companionship, exposure to climatic extremes, excessive fatigue, and the horrors of war. It discusses the agencies in the Army that can be of assistance in the individual's adjustment.

Lecture No. 2 takes up the problem of emotions and feelings and how to handle them. It includes a discussion of disciplinary offenses, malingering, sick call, worry, fear, resentment, and the psychosomatic disorders.

Lecture No. 3, entitled "A Healthy Viewpoint Toward Being in the Service," stresses the fact that a big and tough job is to be done in the Service, and why the job must be done completely and thoroughly.

This TB MED is now being revised because of the changing war picture, the increased functioning of the I & E Division, and the experience gained by training center psychiatrists in giving these lectures during the past year and a half. More emphasis will be laid on the fact that men usually adjust to the Army without difficulty. Greater attention will be paid to the problem of sick call and psychosomatic symptomatology. Motivation will be stressed. The lecturers will be instructed to make full use of training aids and group participation.

PSYCHIATRIC SOCIAL WORK

TB MED 154, June 1945, is a guide for military psychiatric social workers (SSN 263), outlining the goals and accepted practices of psychiatric social work in the Army. It is also intended to orient other military personnel in this field of work. The educational and experiential qualifications of psychiatric social workers are stated, recognizing that in the Army there must be far greater latitude than in civilian practice. The military psychiatric social worker acts as an assistant to the psychiatrist, making it possible to accomplish far more than could be done without his collaboration. His many functions are discussed. Chief among them is obtaining a full psychiatric history from the patient and other Army personnel with whom the patient has been in contact, giving individual treatment interviews and group psychotherapy under the direction of the psychiatrist, and aiding in the administrative procedures in the clinic or hospital in which he works.

This bulletin describes also the qualifications and duties of a group of specially enlisted members of the WAC, known as psychiatric assistants. It lists the duties and responsibilities of the professionally best-qualified military psychiatric social workers who act as supervisors. It also develops fully the relationship between the Red Cross and military psychiatric social workers.

CLINICAL PSYCHOLOGICAL SERVICE IN ARMY HOSPITALS

Clinical psychologists commissioned in The Adjutant General's Department are available for assignment to the neuropsychiatric sections of named and numbered general, station, regional, and convalescent hospitals, consultation services, disciplinary barracks, and rehabilitation centers (W.D. Circular No. 71, 1945).

Clinical psychologists will be assigned to duty in neuropsychiatric sections of the installations concerned, and will serve under the direction and supervision of the chief of that section. Their duties will be to: (1) aid in development and administration of counseling programs; (2) assist in preparation of clinical records, particularly by administration and interpretation of special psychological tests; (3) aid in studies of psychological

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

problems of classification, retraining, and reassignment of neuropsychiatric patients; and (4) perform such other professional or administrative duties as will best assist the neuropyschiatrist in the accomplishment of his mission.

War Department Field Manual 21-6, section XII, issued periodically, contains a complete list of tests which may be requisitioned from Adjutant General depots in accordance with War Department Circular No. 443, 1944, and subsequent amendments. For individual evaluation of personality and intelligence the Wechsler-Bellevue Intelligence Scale, the Rorschach test, the Murray Thematic Apperception Test, and the Minnesota Multiphasic Test should be adequate. These are ordered on medical supply requisitions through normal medical supply channels addressed to: Office of The Surgeon General, Attention: Neuropsychiatry Consultants Division, Washington 25, D. C. (TB MED 115, 14 Nov. 1944)

MEDICAL DEPARTMENT PSYCHIATRIC FILMS

New films dealing with psychiatric problems in the Army are available for showing to Army Medical Department personnel to whom they should be of great importance and interest. The following films may be obtained by requisition from Signal Corps film libraries and sublibraries in posts, camps, and stations overseas and in the zone of the interior.

Psychiatric Procedures in Combat Areas (FB 184) presents combat psychiatric cases and psychiatric interviews and procedures. The film demonstrates the advantage of forward psychiatric care for cases that develop in combat and describes the results. It shows the handling of cases from the division clearing stations to base hospitals. The picture was filmed in Italy under the supervision of psychiatrists who were later sent to the zone of the interior to aid in completing and editing it.

The New Lot (*Misc.* 1133), which was adopted by the U. S. Army from the British film, demonstrates the adjustment problems of five men in the British Army. It shows these men as civilians and in various stages of facing and solving problems of adjustment to the demands of Army life (available only in the zone of the interior).

Psychiatry for the General Medical Officer (Misc. 1167) was adopted by the U. S. Army from the British. This film depicts nervous conditions in average persons in civilian life and shows how they may be carried over into Army life and add to the development of psychiatric reactions to combat. It shows various types of cases, how they are treated in combat areas, and how psychiatric disorders may insidiously develop in officers as well as enlisted men.

The following psychiatric films, also recently released, are available for showing to Medical Department personnel and are very useful for the purposes indicated below:

Introduction to Combat Fatigue (TF 8-1402) demonstrates the development of combat fatigue and explains how and why it develops. In addition to its importance for use in training Medical Department personnel, it can also be valuable for use in selected neuropsychiatric cases in group psychotherapy.

Care of the Sick and Wounded—The NP Patient (TF 8-1428) and *Ward Care of Psychotic Patients (TF 8-2090)* are valuable for training all Medical Department personnel. The films supplement each other in that "Ward Care of Psychotic Patients" demonstrates certain specific psychiatric methods and techniques, while "The Care of the Sick and Wounded—The NP Patient" gives a more general picture and emphasizes the proper approach and attitude necessary in constructive handling of neuropsychiatric patients.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

DISPOSITION OF PSYCHIATRIC CASES

The belief is widespread, possibly because of misinterpretation of previous directives, that neuropsychiatric patients should not be treated and also that most individuals with psychoneuroses improve immediately after discharge. While this may be generally true, instances where they fail to improve are sufficiently common to warrant individual evaluation of each patient. In no case should individuals with psychoneuroses who are too ill to be at home be discharged from the service and permitted to return home without having been offered the opportunity of further treatment in a Veterans' hospital.

Those individuals who have become incapacitated by psychoneuroses resulting from overseas service should not be discharged from the service until maximum improvement in a convalescent hospital has been attained. As a rule, general hospital patients with psychoneuroses who, even after treatment, remain too ill to be transferred to a convalescent hospital should be transferred to a Veterans' hospital unless they specifically request that this not be done. While the ability of the patient to adjust in a convalescent treatment program of the type outlined in TB MED 80 should not be an absolute criterion of the severity of illness, it is highly probable that those who are too ill to partake of such a program are too ill to be sent home. This principle should be used as a guide. It does not preclude the use of good medical judgment in determining whether or not a patient should be transferred to a Veterans' hospital. Those patients whose conditions enable them to return directly to duty should not be transferred to convalescent hospitals.

Zone-of-interior patients with psychoneuroses are treated locally. Transfer to a convalescent hospital is reserved for those patients who require additional treatment which cannot be given locally when there is a reasonable expectation that the additional treatment will result in restoration to general duty. As with overseas cases, those who will require further hospital care should be transferred to Veterans' hospitals unless they specifically request that this not be done. (W.D. Circular No. 162, 2 June 1945)

SEA EVACUATION OF PSYCHIATRIC PATIENTS

The policy concerning the treatment of psychiatric patients on board ship is prescribed in a letter dated 21 September 1944 from the Office of Chief of Transportation to the commanding generals of all ports of embarkation. The following paragraphs have been extracted from the letter:

"Where space is available and the numbers of various types of patients permit, Class 1A (psychotic) and 1B (improved psychotic and potentially suicidal) patients should be quartered in separate wards. This separation is desirable so that 1A patients will not disturb the 1B patients and so that a more efficient recreation and orientation program may be developed. Properly classified Class 1C (open ward) patients should be quartered with other ambulant and troop class patients; only when there is conclusive evidence of improper classification of unfavorable reaction to the voyage should a Class 1C patient be placed in a security accommodation.

"Class 1B patients, weather and the number of attendants available permitting, and with concurrence of the transport commanding officer:

(1) Should be brought to a selected space upon the deck for an hour or two daily.

(2) May be given some freedom below deck when justified in the opinion of the medical officer in charge.

"Class 1C patients should be accorded the same privileges as the ambulant and troop class patients with whom they are quartered.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

"Much of the difficulty encountered in the transportation of mental patients may be avoided by efforts directed toward their orientation. A few well chosen words with regard to returning home, Z.I. hospitalization policies, and the favorable outlook for recovery will aid in accomplishing this. Class 1B cases may be set at ease by assuring them that they are confined in their own interest, to avoid the possibility of their committing acts while depressed, which they would later regret.

"Emphasis should be placed on, and every effort should be made to accomplish, a planned recreational program.

(1) Motion pictures (avoiding battle films) are of great value.
(2) Planned program of music, recordings, radio programs, group singing. Use of small instruments by the patients.
(3) Small games.
(4) Selected crafts under close supervision—projects being taken up at the end of the recreation period.

"It is desired that copies of TB MED No. 80, dated 3 August 1944, and TB MED No. 84, dated 10 August 1944, be supplied to hospital ship commanders, transport surgeons, and medical hospital ship platoon, separate, commanders. Insofar as practicable, under the conditions imposed aboard the various ships, the suggestions and principles contained therein will be employed in the care of mental patients aboard ship.

"Personnel for duty with neuropsychiatric patients should be selected with great care—particularly, they should be selected for their steadiness and tact. It is realized that such selection will be impracticable of full realization on ships other than hospital ships. However, individuals assigned to ship platoons, who possess such characteristics, should be routinely assigned, when available, to the care of neuropsychiatric patients aboard troop transports.

"Whenever possible, usually when hospital ships are in port for repairs or when hospital ship platoons are awaiting assignment, personnel selected, as in the above paragraph, including officers and enlisted men, should receive training in the neuropsychiatric section of a port hospital, or when possible, local arrangements should be made to have such training given in a nearby general hospital."

NEUROLOGICAL DIAGNOSTIC TECHNIQUES

TB MED 76 standardizes and delineates the generally accepted indications, contraindications, performance, and interpretation of common neurological diagnostic and examination methods used in military hospitals. Those who intend to use these methods should familiarize themselves with the detailed information in this bulletin. The diagnostic methods included are:

1. *Lumbar puncture.* In addition to a discussion of the general technique of lumbar puncture and spinal manometry, including the Queckenstedt test, the indications for lumbar puncture in acute head injuries and cerebral vascular accidents are outlined. Cisternal punctures are to be done only when absolutely indicated and then only by those trained in this technique.

2. *Pneumo-encephalography.* The indications for undertaking this procedure together with the technique have been outlined. Under technique are included not only the technical procedure itself but also the pre- and post-pneumo-encephalographic care of the patient which is so extremely important. This procedure is not without risk and should rarely be undertaken where neurosurgical intervention is not readily available. It should not be undertaken by those who are not familiar with this procedure.

3. *Cutaneous resistance testing.* The clinical uses and limitations of the dermometer (Richter) and instructions for its use are outlined.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

NEUROLOGICAL TRAINING

A well-established program for the training of men in neurology is a main function of the School of Neuropsychiatry at Mason General Hospital, Long Island, New York. The twelve-week course given includes basic training in both neurology and psychiatry. At the conclusion of this period six to eight men who have shown particular interest and aptitude in neurology are assigned for an additional thirty days' training in neurology. This advanced course includes training in interpretation of the electroencephalogram as well as further instruction in clinical neurology. On the completion of this training these men are then assigned to the neurological centers where they are under the supervision of trained neurologists who round out their neurological instruction.

There is also a school for the training of enlisted men as technicians in the operation of the electroencephalograph. The training program is located at Mason General Hospital and DeWitt General Hospital. This is a ninety-day course which covers all the technical considerations of operating the machine and its clinical application. These technicians are on the critical list of needed specialists and are frozen in their jobs. After training they are assigned to the various neurological centers where their services are needed.

ELECTROENCEPHALOGRAPHY: OPERATIVE TECHNIQUE AND INTERPRETATION

TB MED 74 was written to standardize the techniques and practices to be used in military hospitals where electroencephalography is being done. Electroencephalography is the technique of recording the electrical activity of the brain. It requires very careful and detailed attention to the technique of operation to produce satisfactory records. Various kinds of electroencephalographs are used in civilian practice. After careful consideration, the Army has standardized on one superior type of machine, which must be operated according to the instruction manual provided by the manufacturer.

The electroencephalogram is difficult to interpret because normal persons show a wide variety of different patterns. Despite these complexities, valid diagnostic standards have been established for electroencephalography, and it is now possible to learn to interpret electroencephalograms as one learns to interpret x-rays, by firsthand experience under the guidance of a competent teacher. The interpretation of electroencephalograms should always be done by the medical officer in charge of the laboratory. Definite standards of interpretation have been set for the Army; this is the Gibbs' classification. It is important to remember that the usefulness of electroencephalography is limited. The routine electroencephalogram is normal in about 10 percent of adult epileptics; and severe brain damage, particularly in subcortical areas, may be associated with no electroencephalographic abnormality. In interpretation, caution is desirable, but it is not a substitute for accuracy and discernment. The wave-patterns that correlate with normal and those that correlate with abnormal states of brain function and the degree of correlation must be learned from firsthand study.

When electroencephalography is expertly practiced, it provides an important aid in the diagnosis of epilepsy and of organic brain damage; it gives evidence of great practical value in cases of localized brain damage. However, when improperly applied it is a waste of time or a detriment to diagnosis. Therefore, the Army requires that its electroencephalographic laboratories be operated at the highest level of technical competence. Those interested in this technique are referred to the bulletin for a more detailed discussion.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

Vol. IV
No. 3

DENTAL SERVICE

INSTRUCTIONS FOR PREPARING AND MAILING PROSTHETIC CASES TO CENTRAL DENTAL LABORATORY

1. *General.* a. All dental officers responsible for initiating or rendering prosthetic service will comply with the following instructions when cases are being prepared for the central dental laboratory (C.D.L.). b. Direct correspondence is invited between prosthetic dentistry officer at camp or station and the C.D.L. to assure the greatest operating efficiency. c. Failure to comply with the basic instructions herein will result in return of the case to the original sender untouched. d. Every effort will be made to construct appliance in accordance with the design and materials requested, but the final decision regarding construction will be that of the C.D.L. e. There are five C.D.L.'s in continental United States, several subcentral dental laboratories and various C.D.L.'s in oversea theaters. While oversea C.D.L.'s may have special "theater" rulings, as well as individual problems relating to supply and transportation, the general principles regarding case construction are applicable to all military installations. In general, the C.D.L.'s located at the following centers in the United States serve stations in the geographic limits of the commands indicated: (1) Army Medical Center—First, Second, and Third Service Commands, and the Military District of Washington. (2) Fort McPherson, Georgia—Fourth Service Command. (3) Fort Sam Houston, Texas—Eighth Service Command. (4) Presidio of San Francisco, California—Ninth Service Command. (5) Jefferson Barracks, Missouri—Fifth, Sixth, and Seventh Service Commands. f. The C.D.L. will insert the name and Army serial number on all dentures constructed in the C.D.L. wherein such an identification is applicable.

Major General Robert H. Mills, U. S. Army, director, Dental Division, The Surgeon General's Office.

2. *Policies regarding dental prosthetic treatment.* a. Dental services during and for six months after war (A.G. 703.1 (4-16-42) MO-S-M, 25 April 1942). See paragraph 4a regarding partial dentures. A fixed bridge may be inserted in the anterior segment, in limited cases, as a morale and functional factor in cases where extraction has caused a disfiguring space. b. Treatment for dependents. Dental attendance for dependents will be limited to emergency treatment. Such treatment will interfere in no instances with the routine dental treatment of military personnel. c. Treatment of War Department civilian employees within the United States. Dental attendance for civilian employees will be confined to emergency treatment as outlined

Abstract of TB MED 148, March 1945.

Digitized by Google
Original from, UNIVERSITY OF CALIFORNIA

in paragraph 2c(4) and (5), AR 40-505, 1 September 1942. d. Treatment of War Department civilian employees on foreign military missions. In accordance with a Third Indorsement, W.D. S.O.S., S.G.O., 16 October 1942, to The Commanding Officer, Ft. Read, Trinidad, B.W.I., the following policy is in effect: "4. Replacement of missing teeth for the above outlined civilian personnel will be made when in the opinion of the dental surgeon it is necessary from a health or functional standpoint. Such replacements will be the standard type of full or partial dentures provided in the Army except that anterior teeth, lost in line of duty, may be replaced by fixed bridgework when in the opinion of the dental surgeon it is advisable. This type of replacement is to be kept at a minimum consistent with the best interests of the Government and the individual. 5. The treatment outlined in paragraph 4 above will interfere in no instance with the routine dental treatment of military personnel."

e. Treatment of Red Cross personnel. According to a First Indorsement, A.G. 703 (9-21-42) OB-P, W.D., A.G.O., 8 October 1942, to The Surgeon, U. S. Army Station Hospital, Fort Lewis, Washington, the following policy is in effect: "Red Cross personnel on duty with the Army in the United States, where civilian facilities are available, are entitled to dental treatment only when an inpatient and if this treatment is necessary in connection with the condition for which they were hospitalized. This does not include the replacement of missing teeth." f. Treatment for prisoners of war. According to paragraph 87 of FM 27-10, Rules of Land Warfare, "Every camp shall have an infirmary, where prisoners of war shall receive every kind of attention they need." Prisoners, therefore, are entitled to the same dental treatment as outlined in A.G. Letter 703.1 (4-16-42) MO-SP-M, 25 April 1942, subject, "Dental service during and for six months after the war." g. Treatment for retired personnel. Paragraph 2b(2), AR 40-505, states that dental attendance will be provided for "Persons who are on the retired list of the Regular Army and who report in person at any Army dispensary or hospital, provided sufficient accommodations are available for their treatment." Dental treatment for retired personnel is a local problem. h. Treatment of Allied military personnel. Military personnel of Allied nations in the zone of interior and theater of operations will receive the same dental treatment as U. S. Army personnel (A.G.O. letter 370.5 (4-4-42) MS-SPGAM-M, 7 July 1942).

3. *Type of laboratory service accomplished at C.D.L.* a. Two C.D.L.'s are prepared to do vitallium work. No ceramic work is accomplished at any C.D.L. Ordinary inlays, single crowns, and attachments for bridges will be made in local camp or station laboratories, if facilities are available. b. The C.D.L., Army Medical Center, Washington, D. C., is prepared to accept vitallium cases, and for this type of work will service the stations in the geographic limits of the first six service commands, Panama Canal, and foreign stations in the Atlantic area, while the laboratory at Fort Sam Houston, Texas, will serve stations in the geographic limits of the remaining service commands, Alaska, and all foreign stations in the Pacific area.

4. *Partial dentures.* a. Which soldier needs a partial denture. It is not possible to state that a given number of natural teeth are necessary to masticate the average foods. The size, shape, condition, and position of the dental arches, as well as the teeth, are all determining factors which indicate the need for a denture. The replacement of a single tooth, or one tooth on each side of the arch, by a partial denture, ordinarily will not be accomplished. The insertion of a unilateral partial denture will be limited to the exceptional case, and such appliances generally will not be constructed. The morale of the individual, however, must always be considered. b. Opening the bite. Partial dentures, which cover the remaining natural teeth, will not be employed in the opening of a bite.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

ACRYLIC DENTURE IDENTIFICATION

Full dentures, upper and lower, and partial dentures whenever possible, will have the wearer's initials, surname, and Army serial number placed thereon at the time the case is originally processed in the station or central dental laboratory. This identification, whenever practicable and applicable, will also be placed on all full dentures, upper and lower, and partial dentures which are being relined, rebased, or repaired. This should be accomplished in the laboratory or at the dental chair. The laboratory or dental officer may employ the technique of choice. (W.D. Circular No. 173, 11 June 1945)

DENTAL BOOKS AND JOURNALS

The basis of issue for dental books and journals is set forth in Tables of Organization and Equipment and Medical Department Equipment Lists.[1] Requisitions for books or journals should not be submitted through channels unless the station or hospital is authorized by T/O & E and Medical Department Equipment Lists to receive such. Not all stations are eligible to receive all the items herewith listed.[1 2]

Book	*Author*	*Item No.*
1. Accepted Dental Remedies	A.D.A.	B 000042
2. Dental Roentgenology	LeRoy Ennis	B 000043
3. Dental Treatment of Maxillo-facial Injuries	Fry, et al.	B 000442
4. Partial Denture Construction	E. Kennedy	B 000044
5. Textbook of Operative Dentistry	W. H. O. McGehee	B 000045
6. Textbook of Periodontia	S. C. Miller	B 000047
7. Surgical Diseases of the Mouth and Jaws	E. C. Padgett	B 000040
8. Theory and Practice of Crown and Bridge Prosthesis	S. D. Tylman	B 000041
9. Operative Oral Surgery	Leo Winter	B 000177
10. Atlas of the Mouth	Massler and Schour	B 000443
11. Oral Pathology	K. H. Thoma	B 000473

Journals for Hospitals of 1,000 *Beds or Over*[3]

1. American Journal of Orthodontics and Oral Surgery. 2. Dental Digest. 3. Dentistry—A Digest of Practice. 4. O S*—Journal of the American Dental Association. 5. OS*—Journal of Oral Surgery.

Hospitals of 250-999 beds receive the same journals as cited for hospitals of 1,000 beds or over, while the overseas hospitals with 25 to 249 beds receive only the *J.A.D.A.* and the *Journal of Oral Surgery.*

REFRESHER DENTAL PROFESSIONAL TRAINING

Refresher professional training is authorized for Dental Corps officers who, because of assignment to command, administrative, or limited professional duties, have not been engaged in the professional aspects of general dental service during the past twelve months or more. Priority for such training will be given to officers who have served overseas. However, any dental officer in continental United States who is not now serving in a general hospital, who has been restricted to one or two phases of dentistry during the past twelve months, and who is interested in spending three months on a rotation basis in all phases of general dentistry may make application through channels. Officers selected for this training will be ordered on temporary duty, with per diem, for not more than twelve weeks. (ASF Circular No. 155, 1 May 1945)

---

*O S indicates journals which will be supplied overseas installations.

1. W.D. Supply Bulletin, SB 8-20, Medical Department Professional Books, May 1945.

2. W.D. Supply Bulletin, SB 8-3, Medical Department Professional Books, 21 Mar. 1944.

3. W.D. Supply Bulletin, SB 8-4, Medical Department Professional Journals, 21 Mar. 1944.

Digitized by Google Original from UNIVERSITY OF CALIFORNIA

VETERINARY SERVICE

MEAT AND DAIRY HYGIENE INSPECTION

The Army Veterinary Corps inspected, during the calendar year 1944, more than 8 billion pounds of meat, meat-food, and dairy products, including more than 1 billion pounds purchased by the Army for the Navy, Marine Corps, and other governmental agencies. Of the total amount inspected, 300 million pounds were rejected, prior to purchase or offer for delivery, because of failure to meet provisions of the contract with regard to type, class, or grade, and about 60 million pounds were rejected because of insanitary or unsound condition. The amount of these foodstuffs inspected was an increase of 36 percent over that inspected during the year 1943 and an increase of 155 percent over the amount inspected during 1942.

Raymond A. Kelser, Brigadier General, U. S. Army, director, Veterinary Division, The Surgeon General's Office.

Procurement of the huge quantities of meats indicated by the above figures presented considerable difficulty during the past eighteen months. To alleviate the situation, the War Food Administrator promulgated War Food Order 75-2, Amendment 7, effective 1 April 1944, imposing a modified form of Federal meat inspection on all uninspected packers slaughtering weekly 52 or more head of Army-grade beef cattle. These packers are required to set aside for Government purchase 50 percent of steer, heifer, and cow beef meeting the provisions of Army specifications. The additional veterinary inspectional personnel necessary under this War Food Administration order was not available from the Federal Meat Inspection Service. It, therefore, was necessary, under an agreement between the Secretary of War and the War Food Administrator, to assign Army Veterinary Corps personnel to make the necessary ante- and postmortem inspections. Details regarding these assignments are set forth in ASF Circular No. 84, 23 March 1944. Subsequently, at the request of The Quartermaster General, arrangements were made to extend the ante- and postmortem inspections, in the plants operating under limited inspection, to calves, hogs, and lambs. There are about seventy-five establishments slaughtering cattle, calves, hogs, and lambs, operating under limited inspection provided by Veterinary Corps personnel.

War Department Circular No. 137, 8 May 1945, prohibits post exchanges, officers' clubs, and civilian messes on Army posts from purchasing critical meat supplies from Army commissaries. This has given rise to the question from a number of stations as to whether Veterinary Corps officers can be detailed to perform ante- and postmortem examination at non-Federally inspected slaughtering establishments in order to qualify them to

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

supply meats and meat products for exchanges, officers' clubs, and civilian messes on Army posts. Paragraph 5*a*, AR 40-2150, specifies that meat and meat-food produces used within the limits of a command should originate from sources under Federal inspection. This same regulation, however, provides that under exceptional circumstances, where meat and meat-food products originating in plants under Federal supervision cannot be secured, the fitness of such supplies will depend solely on inspections to be made by veterinary officers.

It has been ruled that the above regulation can be interpreted to authorize a post or station commander, under exceptional circumstances, and within the availability of veterinary officers under his command, to direct the necessary inspections of meat and meat-food products from sources not under Federal supervision in order to qualify them to sell to exchanges, officers' clubs, and civilian messes on Army posts. In this connection, however, the question of general availability of veterinary officers must be carefully considered. The present over-all availability of veterinary personnel is not such as to permit increases in veterinary complements at posts, camps, and stations in order to provide ante- and postmortem inspection service at plants not now under Federal inspection so that they may be qualified to sell to Army exchanges and other post agencies not authorized to procure meat supplies from Army commissaries.

Some provisions of the recently enacted Public Law No. 108, 79th Congress, will be of interest to all veterinary officers. Under the provisions of this law, slaughtering plants which are not operated under the supervision of the Federal Meat Inspection Service are relieved from quota limitations on the number of animals they may slaughter and can ship interstate, provided the Secretary of Agriculture certifies that such plants are operated under clean, sanitary conditions. It will be readily apparent that if the Army procures a material portion of its meat supplies from plants operating under the provisions of this new legislation it will necessitate considerable extension of the Veterinary Corps' inspectional service.

The critical situation with regard to the availability of meat, meat-food, and dairy products and the huge amounts necessary to meet military requirements have made it necessary in the Army's purchases for the feeding of prisoners of war and civilians in liberated and occupied countries to procure foodstuffs of lower type and quality than that ordinarily purchased for the subsistence of our troops. In order that there may be no confusion of this lower-grade product with that passed as meeting the regular specification requirements, it has been arranged to have veterinary officers place a supplementary stamp bearing the letters "P-C" immediately below the regular Veterinary Corps inspection stamp.

Butter and Cheese and Milk

Information reaching The Surgeon General's Office indicates that in some instances the inspection of butter and cheese is being made without adequately supplementing the organoleptic examination with laboratory analyses. While it is necessary to keep at a reasonable level the number of samples sent to the laboratory in connection with the inspection of butter and cheese, it is highly important that adequate laboratory checks be made to ensure that contractors are furnishing these products in compliance with specification requirements as to fat, moisture, etc. Circumstances will make it impracticable in many instances to obtain the results of laboratory tests prior to movement or acceptance of shipments of these products. However, in cases where laboratory examinations indicate that a firm is not supplying products meeting the provisions of specifications and contract requirements, the responsible procurement officer should be notified. In instances where a firm repeatedly attempts to supply butter or cheese which on laboratory

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

examination is found in violation of specifications and contract requirements, The Surgeon General's Office, as well as the officer in charge of the quartermaster market center concerned, should be notified.

In a number of instances, during the past year, milk delivered to the Army as Type II, No. 1, had bacterial counts well in excess of 1,000,000 per milliliter prior to pasteurization. In surveying the situation, the milk expert from the Meat and Dairy Hygiene Branch of the Veterinary Division found that in a number of these cases the milk was not only graded by the use of the methylene blue reductase test but the samples to which the test was applied were taken at the country receiving platforms and not at the city pasteurizing plants. While the methylene blue reductase test is of great value in roughly estimating the bacterial content of milk, it is only an indicator of a definite amount of bacterial activity in the milk under different conditions and does not always correlate closely with the bacterial plate count. Thus, where results of the methylene blue reductase test and bacterial plate counts are in disagreement, the findings with the latter method should govern.

The importance of the phosphatase test as an indication of whether or not milk has been properly pasteurized can hardly be overemphasized. With practically all pasteurizing plants in the country operating beyond normal capacity and often with inadequately trained personnel, checking of the pasteurization process is very important. The great value of the phosphatase test, therefore, will be readily apparent.

Organisms of the *Escherichia-Aerobacter* group are practically always present in milk as it leaves the dairy barn, although, under the most exacting sanitary methods, the number of such organisms is so small that relatively large portions of milk must be cultured in order to detect them. Organisms of this group are usually destroyed when subjected to proper pasteurization. Occasionally, however, a positive coliform test is obtained with milk which has been subjected to proper pasteurization. In some of these cases the results may be due to a strain of coliform organism more heat resistant than the average run of organisms of this group. Thus, in interpreting positive coliform tests, it must be borne in mind that the presence of viable organisms of this type may be indicative of improper pasteurization, an exceptionally heat-resistant strain of coliform bacteria, or contamination after pasteurization. The coliform test has a definite place in milk control work, but care should be exercised in the interpretation of results before excluding a milk supply on the basis of the test alone.

Frozen Whole Milk

The Veterinary Corps has had a considerable interest in the development of frozen whole fluid milk for use on hospital ships. At present a well-homogenized, fresh milk rapidly frozen in quart containers results in an excellent product. The acceptability of this milk has been excellent up to three months after freezing and in a number of instances for longer periods of time. If, however, milk is stored too long, precipitation of the casein frequently occurs. Homogenized whole milk has a distinct advantage over concentrated milk, because when frozen it maintains its flavor longer than does the concentrated product. Furthermore, it is ready for use when thawed, thereby eliminating the necessity of reconstitution and the chances of contamination in connection therewith. By freezing in paper containers having a capacity not exceeding one quart, milk can be served from the original containers without danger of contamination.

Powdered Eggs

During the year 1944, more than 50 million pounds of powdered eggs were inspected by the Veterinary Corps prior to purchase by the Army.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

This represented an increase of 178 percent over the amount of desiccated eggs inspected during 1943. A large amount of work and investigation has been done by the Veterinary Corps with powdered eggs in order to improve the product and its wholesomeness and safety as a food item. These investigations had to do with the total bacterial content of the egg powder and conditions influencing same. Further, attention has been given to the presence and significance of *Salmonella* organisms in dried eggs. A considerable proportion of commercially desiccated eggs is found to contain *Salmonella* organisms. If present in large numbers in egg powder of relatively high moisture content, they may survive for some time and may be a health risk if the egg powder is not properly prepared and well cooked.

Poultry

Army Veterinary Corps inspection of poultry in plants operating under the supervision of the Poultry Inspection Service, War Food Administration, should be conducted in the same manner as meat and meat-food products are inspected in establishments operated under the supervision of the Meat Inspection Division, U. S. Department of Agriculture. Inspections necessary to determine that the provisions of the U. S. Army specifications are complied with, including all steps in cooking, boning, canning, and processing, will be made by the Army Veterinary Corps.

Small Percentage of Food Lost

Of the billions of pounds of meat, meat-food, and dairy products inspected by the Veterinary Corps in 1944, rejections necessary between the time of purchase and actual issue to troops amounted to 0.68 percent, a relatively small figure. In foreign theaters of operations, in the same year, rejections of Army-owned foods of animal origin prior to issue to troops ran 1.2 percent. A large percentage of canned meat, meat-food, and dairy products had to be stored in the open in a number of the theaters under severe climatic conditions. Adequate dunnage was not available in many instances. In spite of these unfavorable storage conditions, the loss on a percentage basis was not large.

ANIMAL SERVICE

While the Army has made limited use of animals in this war, the Veterinary Corps has had to face numerous problems bearing directly on the health and efficiency of those horses and mules under U. S. Army control in the overseas commands and in the United States.

Wherever animals are assembled, the prevention and control of communicable diseases that impair their health are of considerable importance. In the zone of the interior, communicable diseases among military animals have been well prevented and controlled, and, in this, rigid application of preventive measures and immunologic procedures have played an important part. The annual vaccination of Army animals against equine encephalomyelitis, the most serious disease of horses and mules in this country, has prevented entirely the occurrence of this malady among military animals. The routine administration of tetanus toxoid has largely removed tetanus as a disease for concern or serious consideration. Ordinarily tetanus is a relatively common disease among horses and mules. Serious outbreaks of anthrax among civilian animlas in various parts of the country during the past several years resulted in potential exposure of Army animals; however, the disease was prevented in the latter through timely vaccination. Glanders, for many years a serious problem in most armies, has been reduced to insignificance in the United States through the periodic, routine mallein testing of military animals.

In overseas commands veterinary problems in service with animals have been more numerous and difficult than in the zone of the interior. In many

Digitized by Google
Original from
UNIVERSITY OF CALIFORNIA

places animals were procured locally and from areas where communicable diseases were widespread. Thus, preventive and control measures for safeguarding the health of military animals in foreign theaters are particularly important.

In the India-Burma Theater, surra, a protozoan disease caused by *Trypanosoma evansi* and transmitted by flies, is serious and important. It is particularly prevalent in certain areas during the monsoon season. As yet, no well-recognized, thoroughly effective treatment has been found for this malady. The British in India and Burma have been using "Antrypol" and considered they were obtaining reasonably satisfactory results with this agent. The drug is substantially identical with Bayer 205 which has been known for years. Officers of the U. S. Army Veterinary Corps, following the British, used "Antrypol" to some extent in the treatment and prevention of surra in India and Burma. Severe reactions occurred in a number of cases, and, in many, it was not clearly apparent how much of the reaction was due to the drug and how much to the disease. To clarify this question samples of the chemical were brought to the United States and tested on normal horses and mules at the Veterinary Research Laboratory, Army Remount Depot, Front Royal, Virginia. These results showed conclusively that "Antrypol," used in the dosage recommended for the treatment of surra, is markedly toxic for a high percentage of animals, causing severe tissue damage, especially in the liver.

Dr. Harry Eagle, U. S. Public Health Service, and his associates, have developed and tested a new compound, p-arsenosophenylbutyric acid, and have found it highly effective in the treatment of some forms of trypanosomiasis. It had not been tested in the treatment of surra. Through a cooperative arrangement with Dr. Eagle, a quantity of the chemical was obtained, tested on normal animals in this country, and then sent to the India-Burma and China Theaters for tests in the treatment of surra in those areas. The test on normal animals indicated that the drug could be administered in doses in ratio to those used in the treatment of trypanosomiasis in laboratory animals and man, with no appreciable toxic effect. As this is written, cases of surra have commenced to occur among military animals in India and Burma and a preliminary report offers considerable promise of excellent results from the use of this new chemical.

In the China Theater practically every important communicable disease affecting animals has been encountered, and some of them are widespread. Long years of war, the serious reverses suffered by veterinary and other education among the Chinese, and the lack of adequate drugs and biologicals in the hands of the Chinese have contributed to the seriousness of the problem of animal disease prevention and control. In a country largely dependent on animals as a mode of transportation, the importance of animal disease control is obvious. In view of existing conditions, the United States Army Veterinary Corps undertook to help re-establish and improve the Chinese veterinary service and initiate measures for the control of communicable diseases among their animals. This action, which has resulted in considerable improvement, has been highly appreciated by the Chinese and has contributed to the good relations between elements of the Chinese Army and our Army.

While animals have been used in several theaters of operations during this war, their use and importance will be greatest in the China Theater. This problem in China, where, previous to the war, animal disease prevention and control were not on a high plane and where such as they had have been disrupted or eliminated during the war, provides an opportunity for the U. S. Army Veterinary Corps to contribute in a very important way to the war effort in that theater.

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA

INDEX

(Over)

Digitized by Google

Original from UNIVERSITY OF CALIFORNIA

Index—*Continued*

Carlisle Barracks, Pa., 8-2-45—75,500

Digitized by Google
Original from UNIVERSITY OF CALIFORNIA
MAR 23 1946